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The Genus *Psidium* (Myrtaceae) in the State of Bahia, Brazil

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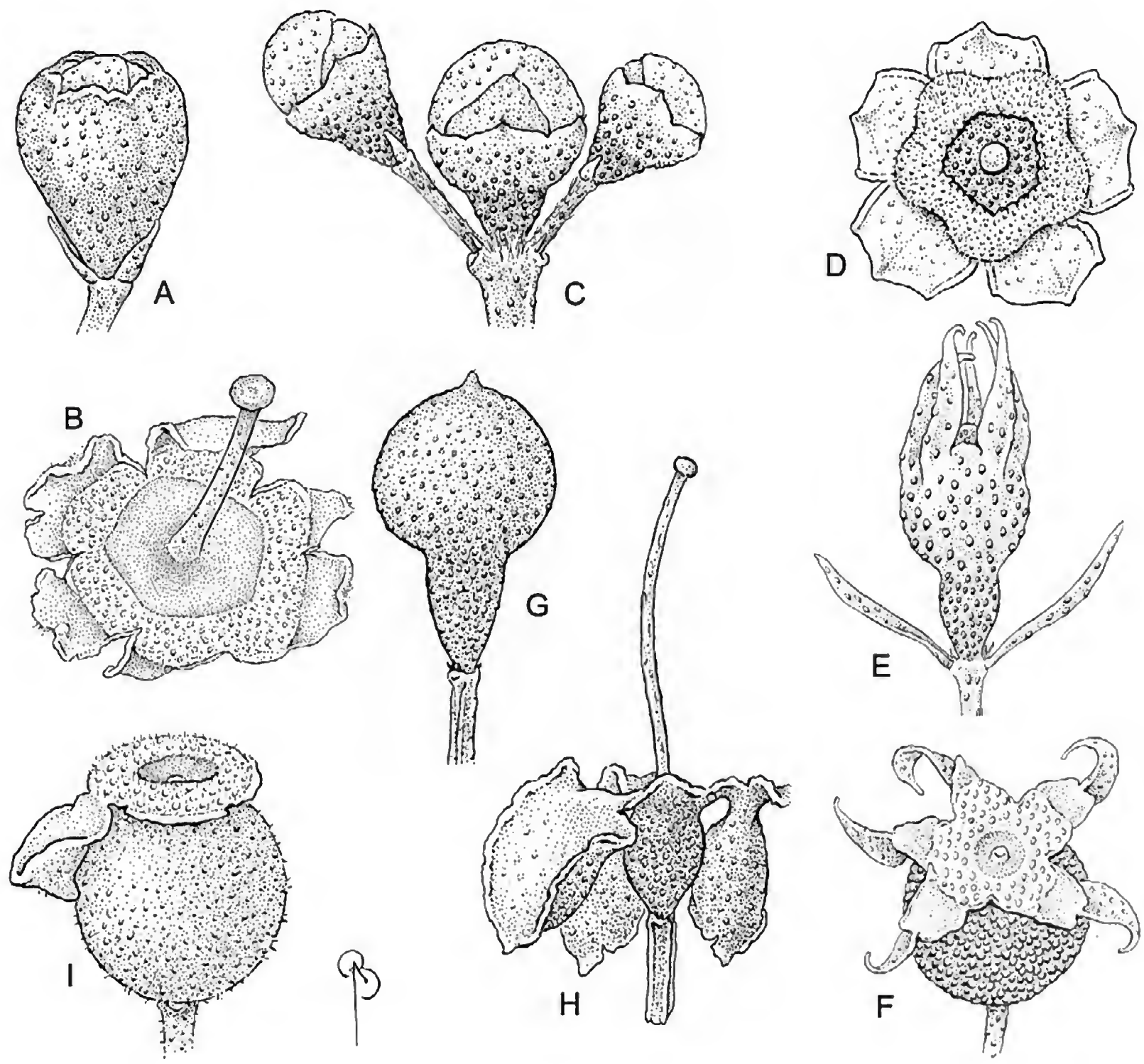

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Canotia is named for *Canotia holacantha* Torr. (Celastraceae), a spiny shrub or small tree nearly endemic to Arizona. Illustration on cover is same as Fig. 2 in text, drawn by Bobbi Angell.

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The Genus *Psidium* (Myrtaceae) in the State of Bahia, Brazil

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Abstract: The genus *Psidium* in the state of Bahia, Brazil is revised and a key to the species is provided. Each of the 28 recognized species is described, illustrated, and a map of known occurrences in Bahia is provided; representative specimens are cited; distinguishing features, phenology, habitat, and distribution are all discussed. Three species are apparently new to science but are poorly known and remain unnamed for now. No new taxa or combinations are proposed, and no lectotypes are chosen. For each species a list of synonyms is provided with the citation of publications and type specimens. In the introduction, relationships with other genera, important characteristics, geography, and needs for future research are discussed.

Resumo: O gênero *Psidium* no estado da Bahia, Brasil, é revisado e uma chave de identificação para as espécies é fornecida. Cada uma das 28 espécies reconhecidas é descrita, ilustrada, e um mapa de distribuição na Bahia é fornecido; exemplares representativos são citados; características distintivas, fenologia, habitat e distribuição são discutidos. Três espécies são aparentemente novas para a ciência, mas são pouco conhecidas e por enquanto permanecem sem nome. Não são propostos novos taxa ou combinações, e os lectótipos não são selecionados. Para cada espécie, uma lista de sinônimos com a citação de publicações e espécimes-tipo é fornecida. Na introdução, relações com outros gêneros, características importantes, geografia, e necessidades de pesquisa futura são discutidas.

INTRODUCTION

My studies of *Psidium* L. began more than 30 years ago. My intention at the time was to complete a Flora Neotropica monograph similar to those I had previously published on *Myrceugenia* O. Berg (Landrum 1981) and *Campomanesia* Ruiz and Pav., *Pimenta* Lindl., *Blepharocalyx* O. Berg, *Legrandia* Kausel, *Acca* O. Berg, *Myrrhinium* Schott and *Luma* A. Gray (Landrum 1986). Although a comprehensive monograph is still a goal, I realize I may not be able to complete such a project. I have decided that publishing regional treatments is more realistic and this paper on *Psidium* of the Brazilian state of Bahia is what I hope may be the first in a series. I am including some information that is more commonly found in monographs than regional revisions, namely, on nomenclature and taxonomically important characters.

Psidium is a genus of at least 60 species and perhaps as many as 100 (McVaugh 1968; Govaerts et al. 2008), ranging from Mexico and the Caribbean to Argentina and Uruguay. Bahia is particularly rich in species of *Psidium* with 28 known so far, about half the total for South America. A few species have been introduced as cultivated plants in the Old World and Pacific Island tropics and subtropics, and some are weedy invasives (Global Invasive Species Database 2017). *Psidium* is one of about 50 genera

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in the tribe Myrteae (Lucas et al. 2007), which includes all the native American genera and species except *Metrosideros stipularis* (Hook. et Arn.) Hook. f. (=*Tepualia stipularis* [Hook. et Arn.] Griseb.) of southern South America. The distinguishing characters of *Psidium* are discussed in Landrum (2003) and in Landrum and Sharp (1989) and are: flowers (4–)5(–6)-merous (occasional flowers rarely with more petals) with multiovulate locules; placenta often peltate; seed coat rough or dull, covered with a pulpy layer when wet (rarely lustrous); hard portion of seed coat (5–)8–30 cells thick at the narrowest point, with the cells thick-walled, elongate, and overlapping; and a C-shaped embryo with cotyledons much shorter than the hypocotyl. Based on small samples of two to five species, recent molecular studies of Myrtaceae (Lucas et al. 2007; Rivero et al. 2012; Murillo et al. 2013; Vasconcelos et al. 2017) indicate that *Psidium* may be a monophyletic group and place it in clades with such genera as *Acca*, *Amomyrtus* (Burret) Legrand and Kausel, *Campomanesia*, *Legrandia*, *Mosiera* Small, *Myrrhinium* and *Pimenta*. These are all members of the morphologically based subtribe Myrtinae (i.e., those genera with embryos with relatively small cotyledons and a large hypocotyl), that appears to be a basal, paraphyletic group in the tribe Myrteae. Larger samples will be needed to determine which genera are the closest relatives of *Psidium* and if it is truly monophyletic.

Taxonomic studies of *Psidium* have been numerous in the last few years with several new species being described (Landrum 2005b, Landrum and Cornejo 2016; Landrum and Funch 2008; Landrum and Parra-O. 2014; Landrum and Proença 2015; Landrum and Sobral 2006; Proença and Soares-Silva 2011; Soares-Silva and Proença 2008; Tuler et al. 2016, 2017) and with the clarification of species limits in some groups (Landrum 2003, 2005a, 2016).

Similar genera. *Psidium* in Bahia is not likely to be confused with most other genera of Myrtaceae. *Myrcia* DC. and *Calyptranthes* Sw. with 5-merous (sometimes calyptrate) flowers generally have paniculate inflorescences, red or black small fruits with few seeds, and embryos with leafy cotyledons folded into a bundle, with a long hypocotyl encircling that bundle. *Eugenia* L., *Myrcianthes* O. Berg, and *Myrciaria* O. Berg have 4-merous flowers, fruits with usually one or two seeds and embryos with the cotyledons fused into a subspherical mass or plano-convex as in a bean.

The recently recognized Bahia-endemic genus *Algrizea* Proença and NicLugh. (Proença et al. 2006) has been confused in the past with *Psidium*. It has 5-merous flowers in dichasial inflorescences (similar to some species of *Psidium*), but the calyx lobes are well developed and separate, the seed coat is thin and not operculate, the ovary is 2-locular, and the placenta is not peltate. The embryo is unique in Myrtaceae, somewhat intermediate between *Myrcia* and *Myrcianthes*. Phylogenetically *Algrizea* appears to be most closely related to the *Myrcia* complex of genera (Lucas et al. 2007) or *Myrciaria* and related genera, i.e. the "*Plinia* group" (Vasconcelos et al. 2017).

Only *Campomanesia* and *Calycolpus* O. Berg are likely to be confused with *Psidium* because they have generally 5-merous flowers, and seeds and embryos similar to *Psidium*. The three genera are compared in the key below.

1. Ovary with (3–)6–18 locules, the locules when fertile usually 1-seeded; locular wall in fruits glandular, functioning as a false seed coat in the fruit so that the "seed coat" appears to be glandular, the locules arranged in a ring in the fruit, several often without a seed inside; leaves with broadly arching lateral veins and often no clear marginal vein; bark flaky or crusty; hypocotyl swollen; anthers with 1 gland in the connective, or none. ..... ***Campomanesia***

1. Ovary with 2–5(–6) locules, the locules when fertile with 1 to many seeds; locular wall in fruits usually not glandular, not functioning as a false seed coat, the true seed coat not glandular, the seeds distributed throughout the fruit, not oriented in a ring; leaves variable but often with a distinct marginal vein; bark variable, but often smooth; hypocotyl not swollen; anthers often with >1 gland in the connective.
   2. Seed coat dull or rough, several cells thick; cells of the hard seed coat surface elongate, overlapping (Fig. 3 A–E); calyx closed or nearly so in the bud, or the calyx lobes usually broader than long, more or less triangular, sometimes only evident as a sinuate margin..... ***Psidium***
   2. Seed coat shiny, 1 to a few cells thick; cells of hard seed coat surface not elongate, abutting each other in a mosaic-like pattern (Fig. 3 F, G); calyx open, the lobes often longer than broad. .....***Calycolpus***

For comparison with other genera of Myrtaceae of Brazil see Landrum and Kawasaki (1997).

Geography. *Psidium* is naturally an American genus, although *P. guajava*, *P. guineense* and *P. cattleyanum* are subtropical and tropical weedy species in many other parts of the world. The greatest number of species (ca. 50) is found in South America and those of Central America and Mexico are a subset of that group. Presumably then, the Central American species are geologically recent arrivals from South America because they have not diverged from their South American relatives. The Caribbean Islands are home to an unknown number of species, perhaps 20 or more, most of which are endemic to the Caribbean, and may, because of their diversity and distinctness from mainland species, represent multiple, geologically old, colonizations.

About half of the South American species of *Psidium* are found in Bahia, Brazil and several (e.g., *P. bahianum, P. ganevii, P. rotundidiscum, P. schenckianum*) are endemic or nearly endemic to that state. The Atlantic Coastal Forest and the adjacent cerrado and caatinga can be considered a center of diversity for *Psidium*. We can speculate, at least, that because of that diversity and endemism *Psidium* has a long history in the Atlantic Coastal Forest and adjacent areas. It is notable that it is not found in temperate southwestern South America; in this respect it is similar to the large Neotropical genera *Calyptranthes*, *Eugenia,* and *Myrcia*, all of which are quite diverse in the Atlantic Coastal Forest (Sobral et al. 2009). *Psidium* is present but less locally diverse in the rest of Brazil, the Andean countries (excluding Chile), and the Guianas.

The Isthmus of Panama has been dated at ca. 2.8 million years old (O'Dea et al. 2016). So prior to that date direct migration without dispersal over water barriers may have been impossible to Central America and beyond. *Psidium oligospermum*, at least, clearly is able to cross significant water barriers, having become established on some oceanic islands (e.g., Galapagos). Colonization of islands, especially when they are new, relatively uninhabited, and with reduced biologic competition, would be more likely than colonization of a continent with many species already growing there. Because of their edible fruits some species of *Psidium* in Central America may have been carried there by humans. I do not know of any fossil evidence of *Psidium* in Central America and Mexico other than archeological finds of *P. guajava* that are about 2000 years old in the Tehuacán Valley of Mexico (Smith 1965).

Three species of *Psidium* in Bahia appear to have similar disjunct distributions: *P. appendiculatum* and *P. brownianum* both are found in Bahia and adjacent states and in northern Venezuela; *P. amplexicaule* is found in Bahia and Sergipe and in several of

the Caribbean islands. I do not know if this is a pattern of disjunction found in other plant groups.

Citation of types. One objective of a monograph is to provide a list of synonyms that is as complete as possible for each accepted name. There are approximately 430 basionyms described for *Psidium*. Of these taxa I consider ca. 60 to belong to other genera (e.g., *Campomanesia*, *Mosiera*) and ca. 370 to belong to *Psidium*, but not necessarily as accepted names. There are also 60 basionyms in other genera (e.g. *Myrtus*) that I believe belong to *Psidium*. So there are ca. 500 basionyms that need to be accounted for eventually. There are also ca. 180 new combinations made in *Psidium* or in allied genera (e.g., *Guajava* Mill., *Mitropsidium* Burret) that are synonyms of species of *Psidium*; that brings the total number of names to be considered to nearly 700. In this paper I account for nearly 270 names. In nearly all cases I have found type specimens or the images of type specimens for the basionyms and cite these with each species. The Global Plants Initiative (GPI; 2014-2017), funded by the Mellon Foundation and administered by JSTOR, is a resource that has greatly facilitated the discovery of type specimens and has been extremely helpful in my efforts.

Any type specimen that is in the GPI database has an identifier that is a combination of the herbarium acronym and the specimen number, e.g., "NY-567890." Many times the numerical part of this identifier includes zeros to the left that do not change the value of the number and I have not included these. An identifier such as NY-0005678 is cited as NY-5678. If I personally have seen a specimen, and it has my annotation, I cite it with an exclamation point (e.g., NY-5678!). If I have only seen it as an on-line image it is cited without an exclamation point. If I have seen a type specimen and it is not in the GPI database, I cite it with an exclamation point but no identifying number. Several type specimens at LE were photographed and the images kindly sent to me in 2003. In exchange I sent annotation labels that are now with the specimens, but I have not seen the specimens themselves.

Specimen databases. This paper is based on studies of ca. 3800 *Psidium* herbarium specimens at various herbaria seen on visits or sent to ASU on loan (http://cotram.org/collections/misc/collprofiles.php?collid=109) and another ca. 1800 housed at ASU (http://cotram.org/collections/misc/collprofiles.php?collid=4). Both these databases can be queried at CoTRAM, Cooperative Taxonomic Resource for American Myrtaceae, (http://cotram.org/index.php). At CoTRAM there are 9 other specimen databases, but since I have not always seen these specimens, the identifications are less reliable. The ASU specimens at CoTRAM have been photographed and are posted with their specimen data.

Species Concepts. I try to follow a species concept in which each species is a morphological continuum with no significant gaps in variation. Between species I believe there should be consistent and significant gaps in character variation. Local cases of hybridization may occur between species and do not necessarily require changing species concepts. I suspect that a morphological continuum may be the result of: individuals being derived from a common ancestor or ancestors; selection by the environment that causes individuals to be similar; and perhaps gene flow. But I have no way of being sure, especially because I base most of my work on herbarium specimens. I must admit that sometimes what I think is a morphological continuum one year is later seen as discontinuous in another year. That has been the case with *Psidium*

acidum (DC.) Landrum and *P. acutangulum* DC. (Landrum 2016). And what I thought to be one disjunct species of *Myrceugenia*, *M. ovata* (Hook. et Arn.) O. Berg, with four varieties (Landrum 1981) is probably at least two distinct species based on molecular studies (Murillo et al. 2012). I hope that the species concepts presented in this paper will be tested by future workers with new techniques, such as DNA sequencing. Tuler et al. (2015) have used SSR markers (microsatellites) to explore infra-generic relations among a few species of *Psidium*. This method promises to be a useful approach and these same studies may reveal unnoticed infra-specific differences. Tuler et al. (2015) report, for instance, that what I believe to be a variable species may be two (see discussion under *P. oligospermum*). I would like to study their voucher specimens before evaluating this view.

Future research. My studies of Myrtaceae have mainly been of herbarium specimens conducted far from natural populations. There are many kinds of studies that can more conveniently be done by researchers that work near living populations. These kinds of studies include: molecular phylogenetics, pollination studies, comparative cytology and genome size, naturally occurring hybridization, narrow and broad population studies of variable species, ethnobotanical/medicinal use studies, essential oils analysis, and evaluation of conservation status. For all these kinds of studies it is imperative that good voucher specimens be made so that the results of any study can be traced back to actual specimens. Posting images of vouchers on the internet will make them especially useful. The identification of the vouchers may change but the results of particular experiments or observations will always be linked to them and will never lose their importance.

Particularly useful field studies could be done of variable and wide spread species such as *Psidium australe*, *P. grandifolium*, *P. guineense*, *P. nutans, P. oligospermum, P. salutare*, and *P. striatulum*. There are three apparently new species, known from single collections, cited in this paper as *Psidium* species A, B, and C. Finding these again, either in the field or as herbarium specimens, would be very useful. A few species are known from very few collections in Bahia (e.g., *P. rhombeum*, *P. riparium*, *P. striatulum*, *P. nutans*) and finding more populations of these species could help in assessing their conservation status. Hybridization studies are another possible interesting type of research that sometimes reveals subtle ecological differences in species. Based on the examination of numerous herbarium specimens and some fieldwork I believe that hybridization occurs between the following pairs of species in Bahia: *P. oligospermum* and *P. schenckianum*; *P. appendiculatum* and *P. schenckianum*; *P. brownianum* and *P. ganevii;* and *P. brownianum* and *P. schenckianum*. In other regions I believe that *P. guineense* hybridizes with *P. guajava*, *P. australe,* and *P. grandifolium* and the last two species hybridize with each other. If these suspected cases of hybridization prove to be true, then their correspondence to different levels of ploidy should be helpful information (see section on chromosome number and genome size below).

IMPORTANT CHARACTERISTICS

There are several morphological characteristics that have been particularly important in distinguishing species. These are briefly discussed below.

Indumentum. The hairs (trichomes) in *Psidium* are unicellular and unbranched, never dibrachiate as they commonly are in some other genera of Myrtaceae (e.g., *Calyptranthes* Sw.). Species vary from being glabrous, or nearly so, to densely covered with indumentum on some or most structures. The pattern of indumentum cover in flower buds and open flowers can be especially important as it compares structures at a similar stage of development. Indumentum of leaves and twigs is often deciduous with time and therefore less reliable. The indumentum may be appressed or spreading, of nearly straight to curled hairs, and of essentially clear, whitish, yellowish, or reddish brown hairs.

Twigs. Young twigs vary from terete or compressed, to quadrangular and somewhat 4-winged. The manner by which the first epidermis falls, by cracking or flaking, and the color in dried specimens may also be important. In some species there are specialized protective "bud scales" that may be associated with species that grow in seasonally deciduous vegetation. Nodes in these species can be significantly wider than the internodes (e.g., sp. nov. A and B).

Leaves. Leaves provide characters of texture, shape, and color when dried as herbarium specimens. Petiole length, blade shape, and size are all useful. The venation of leaves is especially important. The most common type is brochidodromous with the lateral veins (i.e., secondary veins) looping towards the apex near the margin to connect with each other to form a marginal vein that follows the margin, either as a series of arches (e.g., *Psidium brownianum*) or as a scarcely arching vein that nearly parallels the margin (e.g., *P. firmum*). Less common is eucamptodromous venation where the laterals diminish near the margin and no clear marginal connecting vein is evident. In some species leaves may be eucamptodromous proximally and brochidodromous distally and intermediate conditions are sometimes encountered. Cardoso and Sajo (2006) have found a similar situation in Brazilian Myrtaceae but consider it to be a mixture of acrodromous and broquidodromous venation. The tertiary veins that connect the lateral, marginal, and midveins may have a dendritic pattern or a ladder-like pattern (the latter found in eucamptodromous leaves only). The dendritic pattern may seem to be without clear direction or may seem to arise from the marginal vein (e.g., *P. firmum*). Klucking (1988) has done an extensive survey of leaf venation in Myrtaceae. I have not tried to follow his terminology but have consulted his work and recognize similarities in our ways of categorizing venation patterns in *Psidium*. His "Type I" basically corresponds to eucamptodromous and intermediate conditions; his "Type III" corresponds to brochidodromous. He has subtypes of both that I do not accept.

In the axils of leaves it is common to find colleters (small acicular or conical structures), that mimic stipules. Colleters are secretory and protect young growing regions (Silva et al. 2012). So far they do not appear to be taxonomically useful.

Calyx. The calyx structure is especially important in *Psidium*. For convenience, calyx morphology may be divided into two types: bowl-like, with the globe of the corolla clearly visible in the closed flower bud (Fig. 1A; 2C); and closed, hiding the globe of the closed corolla completely or enclosing it except for a terminal pore (Fig. 1B; 2A,G). The amount of closure of the calyx is variable between and sometimes within species. Intermediate states between these conditions occur and several species may have more than one condition.

As the flower bud opens, tears form in the calyx. In a species with a completely closed calyx the tears may be: more or less regular and tear into 5 lobes; irregular (Fig. 2H) tearing into usually 2 or 3 parts; or the whole calyx may fall as a calyptra (2I; frequently but not always in *P. oligospermum* and *P. brownianum*). If the calyx is open and bowl-like tears generally form between the lobes (Fig. 2D). The lobes may be quite reduced and in some cases they are only evident as the sinuate margin of the bowl-like calyx (Fig. 2C).

When the calyx is closed it is not clear where the stamens and petals are attached: on the summit of the ovary (Fig. 1A); or on the inner surface of a calyx-tube (Fig. 1B). As the bud opens the tears forming in the calyx may cut to the staminal ring but not into it (Fig. 2D), or they may cut into the staminal ring (Fig. 2B, F). In the second case the stamens and petals are attached to the inner surface of the calyx tube. The calyx tube might be considered a hypanthium tube. In this paper I restrict the term hypanthium to that tissue covering the inferior ovary.

Another modification of the calyx is the presence of protuberances (flange-like or wart-like) on the outer surface of the calyx near the apex (e.g., *P. appendiculatum*, Fig. 2E, F).

Ovary. Ovaries are 2–5(–6)-locular. The number of ovules per locule varies from as few as 3 to over 250. Numbers below 10 and more than 100 are relatively rare. The placenta usually protrudes as two lamellae that form a peltate structure. The number of rows of ovules on the edge of a lamella varies from 1 to about 4. The best way to observe the locules and ovules is to first rehydrate a bud or flower by boiling in water or soaking overnight in water and a few grains of detergent, and then cutting off the distal portion of a bud, which will contain the stamens (this can be saved for later dissection). Place the cut surface of the remaining portion down. With a dissecting microscope and sharp razor blade progressively slice off sections from the base (proximal) portion of the inferior ovary. When the locules are evident, slice away part of an ovary wall to reveal the ovules and placenta.

Stamens, anthers, and pollen. Stamens vary in length and number (50–800). When all the stamens have fallen, it is sometimes possible to estimate the number by counting scars on the staminal disk. When the number of stamens is very large, counting a half, fourth or fifth of the stamens can give a good approximation of the total. Vasconcelos et al. (2015) have investigated the relative inward curvature of the stamens in the flower bud of the Myrteae and consider it to be a phylogenetically important character. *Psidium* belongs to their "*Pimenta*-group," which they report as being variable. I have not paid close attention to this character so far, but I suspect that it is fairly variable among the species of *Psidium*, varying from incurved to nearly straight in the bud. Longitudinal sections of flower buds illustrated in Figs. 10C (*P. cattleyanum*), 14D (*P. glaziovianum*), 20E (*P. myrtoides*) and 22E (*P. oligospermum*) show a sample of that variability. An illustration of a longitudinal section of a bud with nearly straight stamens can be seen in *P. huanucoense* Landrum (Landrum 2005b, Fig. 2B).

In *Psidium* anthers vary in size from 0.5–3 mm long. In the species of Myrtinae the number of glands in the anthers is variable. Some genera typically have no glands or only one or two (e.g., *Campomanesia*) and in a few genera (e.g, *Calycolpus*) multiple glands are common (Landrum and Bonilla 1996). In *Psidium* the number of anther

glands is variable and can help to distinguish species. The glands can be observed by soaking the anthers in bleach for an hour or so on a microscopic slide, adding water as needed to keep them wet. When they are nearly white, the glands, which remain a darker amber color, can usually be seen with the aid of a microscope.

Tuler et al. (2016) have researched pollen morphology in a sample of 13 species and have found that species and even species groups can be distinguished. I have not worked in this area but it appears to be promising.

Fruits. As in all Myrteae, the fruits of *Psidium* are berries and range in size from 0.5 to 10 cm in diameter but most are between 1 and 3 cm in diameter. There is little information about the color of fruits, but it is probable that when ripe they are different shades of green, yellow, orange, and red at least. Photographic documentation of fruit colors is desirable. Fruit morphology is reported to be correlated with the animals that tend to eat the fruits (Janson 1983). Large fruits with relatively thick walls and of a yellow or green color are likely to be eaten by mammals. This is a common type in *Psidium*. Small fruits with thin walls and of a red or purple color are likely to be eaten by birds. This second type is common in Brazilian Myrtaceae, but perhaps less common in *Psidium*. Observations of fruit predators are certainly encouraged and should be reported on herbarium labels and in publications.

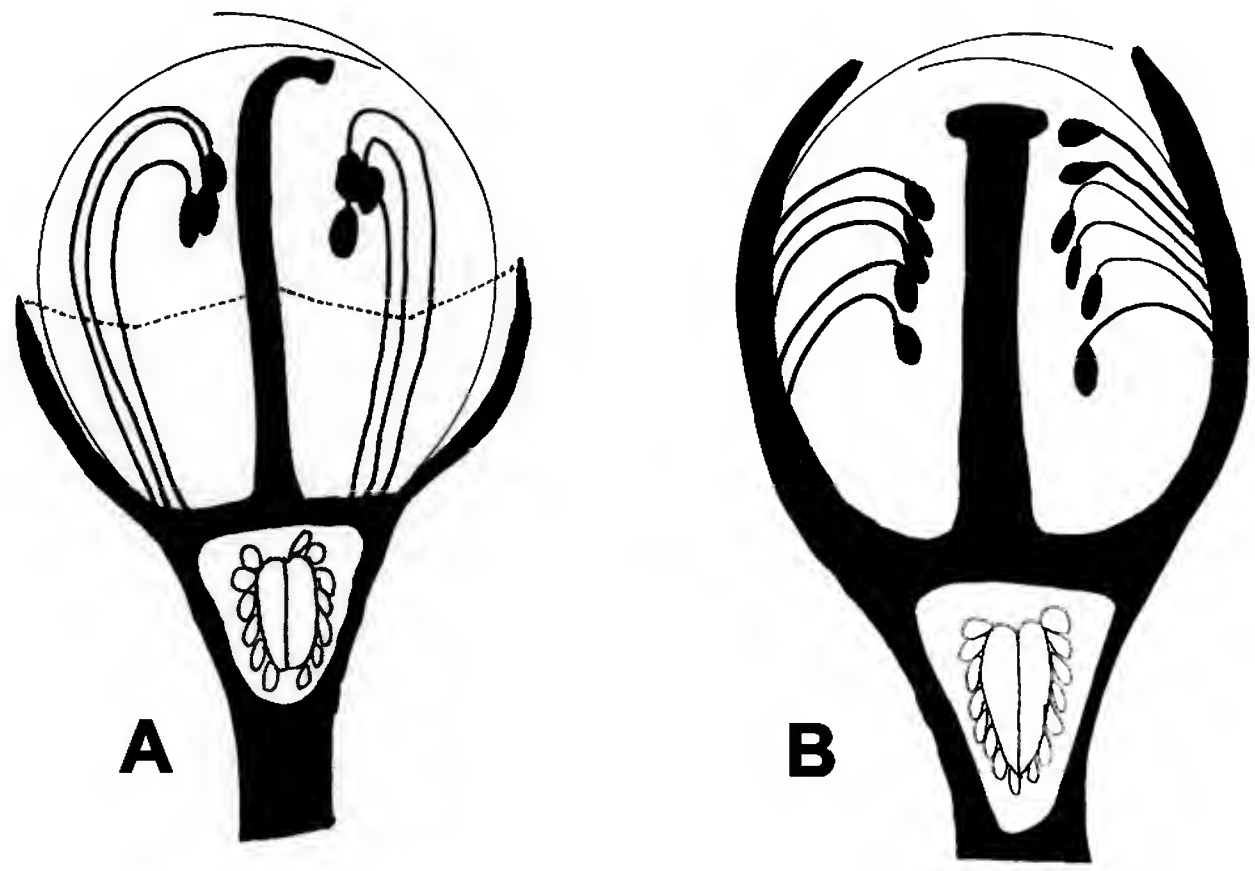


Fig. 1. Schematic drawings of closed flower buds of *Psidium* in longitudinal section showing a single locule with placenta and ovules below; and with calyx, 2 petals, a few stamens and the style above . A. Flower bud with a bowl-like open calyx (as might be found in *P. salutare*; the hidden calyx rim indicated by a dotted line) with stamens and petals attached on about the same level as the calyx at the summit of the ovary. B. Flower bud with a nearly closed calyx (such as is often found in *P. cattleyanum*) with stamens and petals attached on inner surface of the calyx tube, well above the summit of the ovary. As the bud opens and tears form in the calyx, the tears will not cut into the staminal ring in A but will cut into the staminal ring in B.

Seeds. The seeds of *Psidium* are unique among the Myrteae because of their dense cell structure (Landrum and Sharp 1989; Fig. 3 A–E). The cells of the seed coat are elongate, with little or no lumen, and closely packed together and in a few to several

layers (Fig. 3B). The seed surface is not a smooth, shiny mosaic of non-overlapping cells as in most other genera of subtribe Myrtinae with hard seeds (e.g., *Calycolpus,* Fig. 3F,G; *Mosiera*, Fig. H,I), but rather a rough or dull surface when dry and a pulpy layer when wet. The very hard dense seed coat is hard to break and this characteristic may be related to fruit predators. The germinating embryo emerges via a pore in the hard seed coat covered by a plug-like operculum (Rotman 1976).

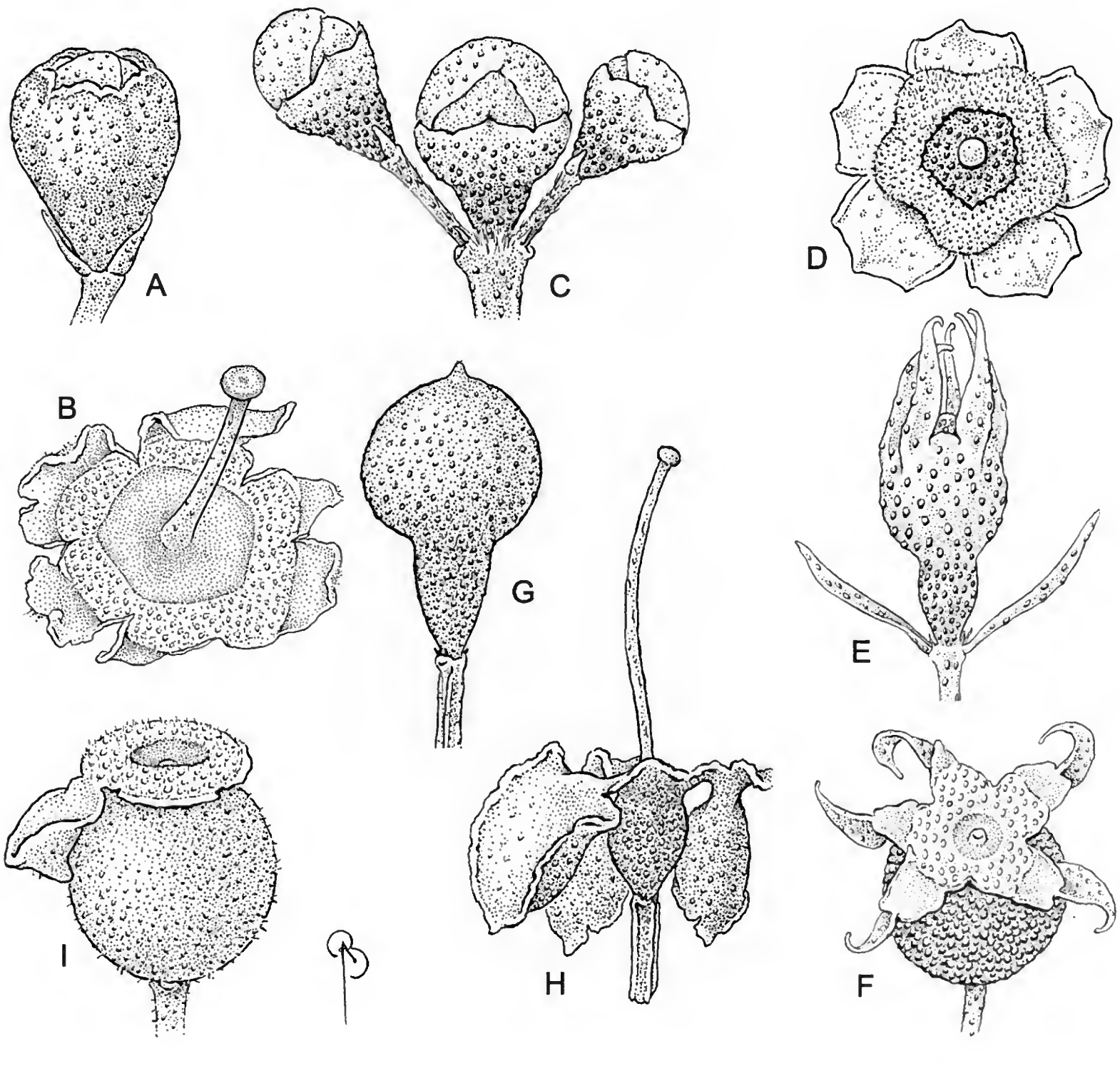


Fig. 2. *Psidium* flowers before and after anthesis. *P. cattleyanum*: **A**, closed bud before anthesis with apical pore; **B**, apical view of flower after anthesis showing tears in staminal ring. *P. occidentale* Landrum and Parra: **C**, 3-flowered dichasium with closed buds; **D**, view from above after anthesis, tears forming between lobes but not penetrating the staminal ring. *P. appendiculatum*: **E**, a nearly closed calyx before anthesis with a flange-like apical appendage on each lobe; **F**, after anthesis, tears forming between lobes penetrating the staminal ring. *P. acidum*: **G**, bud with completely closed calyx; **H**, calyx tears irregularly at anthesis, the staminal ring, not visible in this drawing, is not penetrated by tears at anthesis. *P. brownianum*: **I**, side view of immature fruit showing persistent calyptra and no tears in staminal ring. (A from *Rossato et al. 4855*, ASU; B from *Folli 4925*, ASU; C, D from the isotype *Rubio and Quelal 659*, ASU; E from *Proença et al. 1445,* ASU; F from *Filgeiras and Lopes 2406*, ASU; G, H from *Perea et al. 2098*, ASU; I, from *Stannard et al. H515615,* ASU). All illustrations by Bobbi Angell.

In *Psidium* the number of seeds varies from 1 to over 200 (perhaps as many as 300), but the ranges for a particular species are much smaller. The size of seeds varies from ca. 2.5 mm to 12 mm long. Seed morphology is often important. Seeds may be approximately reniform with uniformly rounded surfaces (e.g., *P. firmum*, Fig. 4A). In this case I believe the seeds mature in the fruit without abutting the fruit wall or other seeds. When seeds develop tightly packed within the fruit they may have nearly flat sides where they abut other seeds and rounded sides that are adjacent to the fruit wall (e.g., *P. myrtoides*, Fig. 4E). In one mainly Amazon group the seeds are tightly packed in the fruit and are often angular with few rounded surfaces (*P. riparium*, Fig. 4B).

Chromosome number and genome size. These are not subjects that I have worked on myself but they have been researched by others and should be valuable in better understanding the evolution of *Psidium*. The common chromosome number in Myrtaceae is 2n=22 but polypoidy is found in *Eugenia* L. and *Psidium* (Rye 1979). Chromosome numbers for *Psidium* have been reported by Atchison (1947), Costa and Forni-Martins (2006), Costa and Forni-Martins (2007), Costa et al. (2008), Chakraborti et al. (2010), and Marques et al. (2016). Genome size can be a measure of ploidy level in *Psidium* and may prove to be a valuable tool in assessing ploidy level in many species of *Psidium* (Costa et al. 2008; Marques et al. 2016). Based on my own studies, hybridization appears to be frequent in *Psidium*; hybridization coupled with polyploidy may explain some of the confusing variation in *Psidium* in such groups as the *P. grandifolium* complex (Landrum 2005a) and in *P. guineense*.

Phytochemistry and Medicinal uses. *Psidium guajava* is known around the world for medicinal properties and has been frequently studied for its chemical components and their effects. Pérez Gutiérrez et al. (2008) offer an excellent summary of these subjects complete with an illustrated appendix of the known chemical components of *P. guajava*. The lesser known relatives of *P. guajava* have not been studied so frequently but I here cite a few recent contributions: *P. guineense* (Fernandes et al. 2012); *P. acutangulum* (Houël et al. 2015; Wen et al. 2011); *P. friedrichsthalianum* (Flores et al. 2013); *P. cattleyanum* (Medina et al. 2011). Further studies of the medicinal potential of other *Psidium* species should prove rewarding.

Essential oils are the most frequently studied compounds in *Psidium*. Commonly several essential oils are found in a single individual but a few will be much more abundant than the others. Among the more common dominant essential oils in *Psidium* are: α-pinene, α-selinene, γ-selinene, 1,8-cineole, β-pinene, β-caryophyllene, β-bisabolene, and p-cymene (Tucker et al. 1995; Silva et al. 2003). There seems to be considerable variation within species as to which oils dominate and whether or not essential oils will be taxonomically important is still unclear.

Flavonoid chemistry has proved helpful in distinguish between *P. guajava* on the one hand (myricetin absent), and *P. guineense* (and its hybrid with *P. guajava*) on the other hand (myricetin present) (Landrum et al. 1995). Flavonoid chemistry may prove useful in other studies of hybridization.

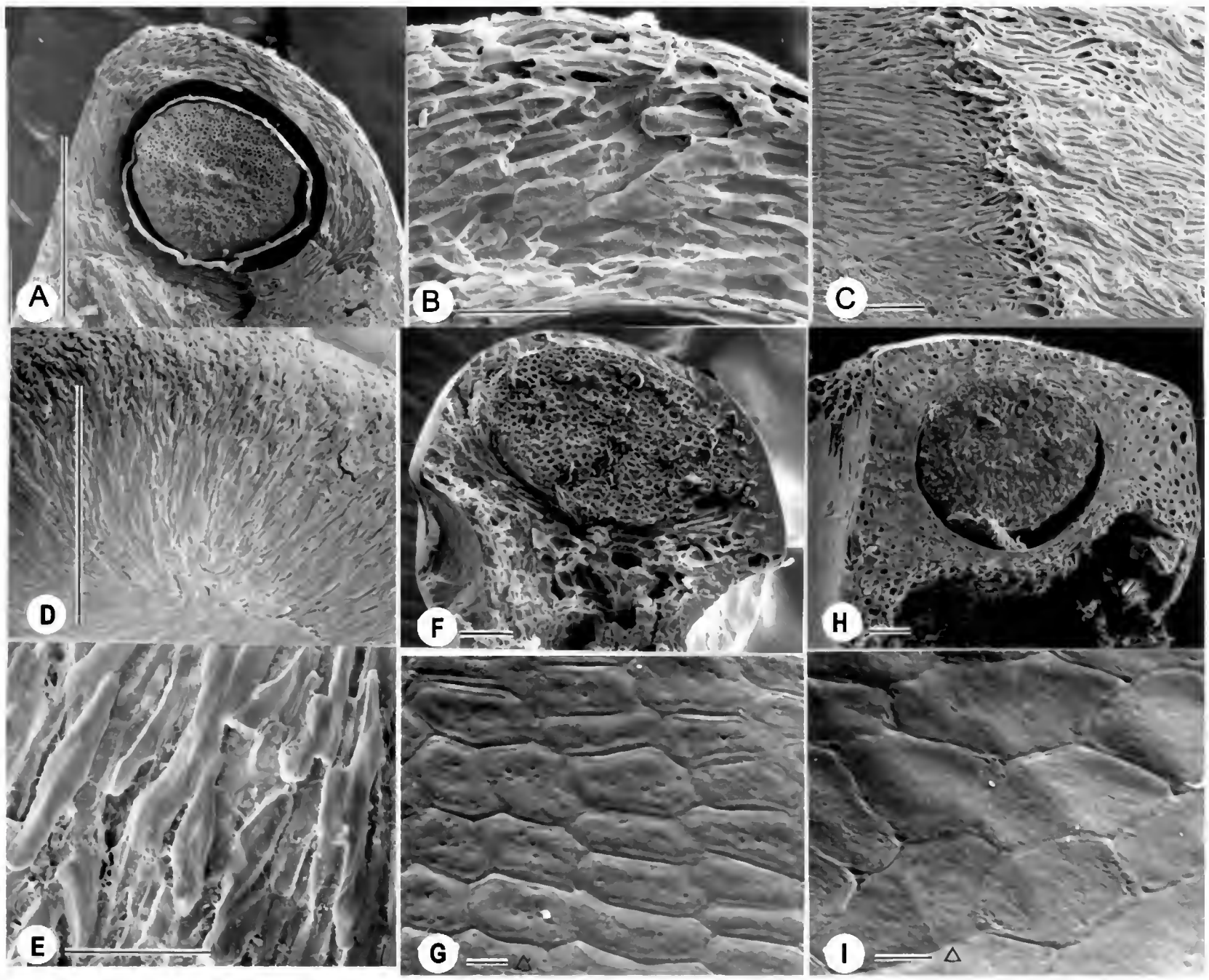


Fig. 3. SEM photographs of seed coats or *Psidium*, *Calycolpus* and *Mosiera*. **A–C**. *P. acidum*: section of seed showing cylindrical cavity and embryo (A), upper portion of seed coat in section (B), and outer surface of seed on right and tangential section (C). **D, E**. *P. australe*: outer seed surface from which outer pulpy covering has rotted away. **F, G.** Seed of *Calycolpus moritzianus*. **H, I.** Seed of *Mosiera elliptica*. Note dense overlapping, elongate cells of *Psidium* versus the mosaic pattern of non-overlapping cells in *Calycolpus* and *Mosiera*. (A–C from *Huashikat 1311*, MO; D, E. from *Montes 851*, NY; F, G. *Davidse and Gonzalez 21134*, MO; H, I. *Clemente 2831*, NY). Vertical lines = 1 mm; horizontal lines without triangle = 1/10 mm; horizontal lines with triangle = 1/100 mm. All photos reproduced from Landrum and Sharp (1989).

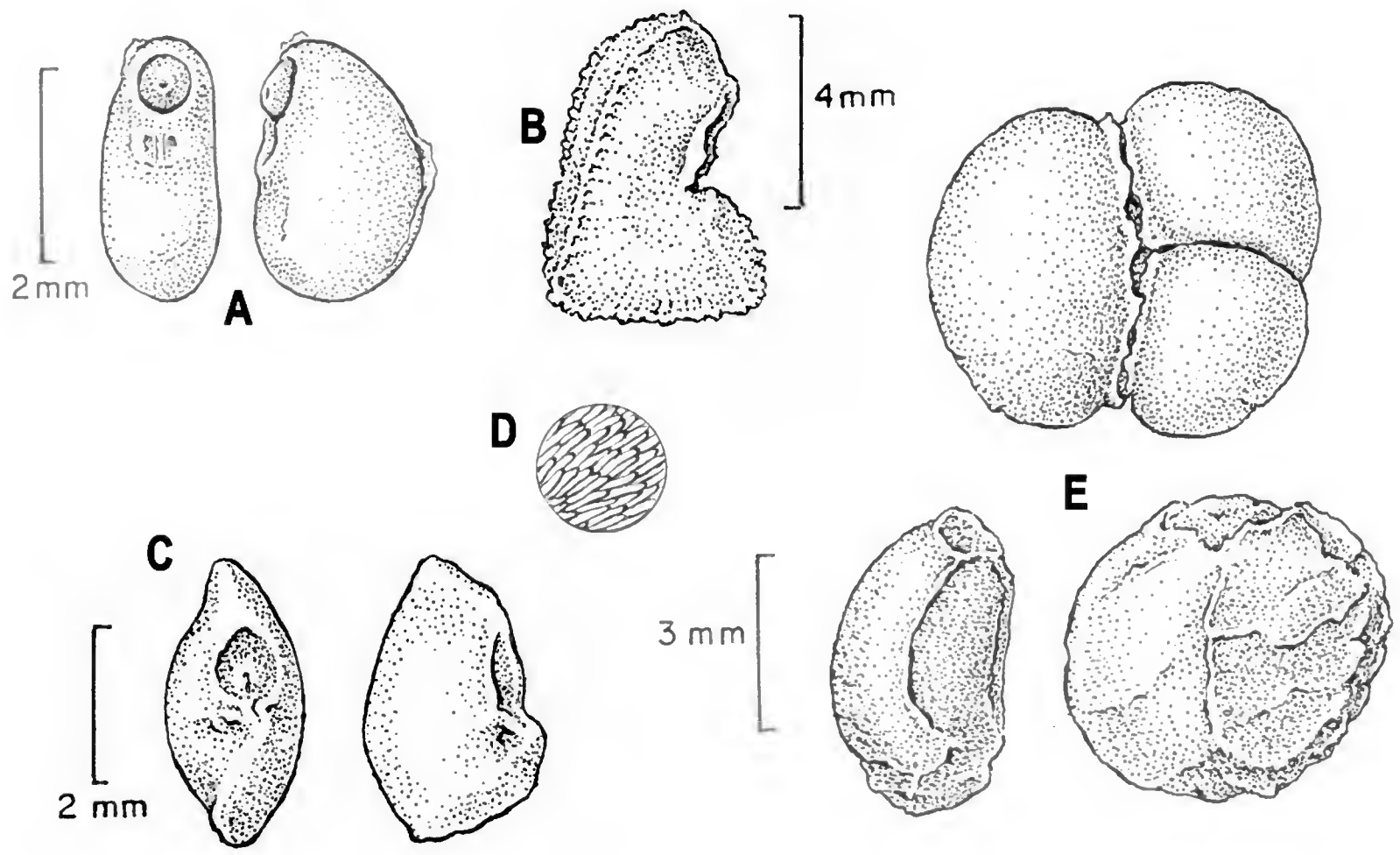


Fig. 4. Seeds of *Psidium*. **A**. Two views of seed of *P. firmum* with rounded edges and generally smooth surface. **B**. Angular seed of *P. riparium* with rough surface. **C**. Two views of seed of *P. myrsinites* with compressed sides. **D**. Close-up of internal cell structure of a general *Psidium* seed. **E**. Above: three seeds of a fruit with rounded smooth surface towards fruit wall and flat rough surface where two seed abut. Below: two views of a seed showing internal rough surface. (A from *Irwin et al. 9189*, MICH; B from *da Silva et al. 4200*, ASU; C from *Azevedo et al. 1098*, ASU; E from *Pereira s.n.*, ASU).

Psidium L. Species Plantarum 470. 1753. Guava, Guayaba [Greek name for *Punica*, which it resembles]. Type species. *Psidium guajava* L.

Guajava P. Miller, Gard. Dict. Abr. ed. 4. 28 Jan 1754. Nom. illeg. nom. superfl. based on the same type as *Psidium* L.

Cuiavus C. J. Trew, Pl. Sel. Pinx. Ehret 4: 12. 1754. Nom. illeg. nom. superfl. based on the same type as *Psidium* L.

Guaiava Adanson, Fam. 2: 88, 563 ('*Guiava*'). Jul-Aug 1763. Nom. illeg. nom. superfl. based on the same type as *Psidium* L.

Calyptropsidium O. Berg, Linnaea 27: 347, 349. Jan 1856 ('1854'). Type species. *C. friedrichsthalianum* O. Berg [≡ *Psidium friedrichsthalianum* (O. Berg) Nied.].

Myrtus subg. **Corynemyrtus** Kiaerskou, Enum. Myrt. Brasil. 39: 18. 1893. Type species. *Myrtus corynantha* Kiaerskou [≡*Corynemyrtos corynantha* (Kiaerskou) Mattos, =*Psidium myrtoides* O. Berg.]

Mitropsidium Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 486. 30 Mar 1941. Type species. *M. pittieri* Burret [=*P. oligospermum* DC.].

Corynemyrtus (Kiaerskou) Mattos, Loefgrenia 10: 1. May 1963.

Subgen. Myrtopsidium Kausel, Lilloa 32: 362. 1966. Type species. *Myrtus mucronata* Cambess. [≡*Psidium mucronatum* (Cambess.) Burret, ≡*Psidium salutare* var. *mucronatum* (Cambess.) Landrum].

Trees and shrubs; *hairs* simple, unicellular**.** LEAVES opposite (rarely ternate or alternate), persistent, or drought deciduous, the venation brochidodromous to eucamptodromous. INFLORESCENCE axillary, uniflorous, a dichasium of usually no more than 3 flowers, or a bracteate shoot (raceme-like). FLOWERS (4–)5(–6)-merous,

occasionally with extra petals; *calyx lobes* essentially free or more commonly their bases fused together in a bowl-like tube, or in some species the calyx lobes fused together in a cap-like calyptra that encloses the closed corolla or that is open only as a terminal pore, at anthesis tearing between the lobes or irregularly or the calyptra falling as a unit; *stamens* ca. 100 to over 700, attached to the ovary summit or on the inner surface of the bowl-like calyx tube, the petals attached just distal to the stamens; *stigma* usually wider than the style, sometimes peltate; *ovary* inferior, (2–)3–5(–6)-locular; *placenta* bilamelate and often protruding in a peltate structure; *ovules* few to numerous, uniseriate, biseriate or multiseriate on each lamella. FRUITS greenish, yellowish or reddish berries, crowned by the calyx lobes, remnants of the calyx, or by a circular scar. SEEDS few to numerous, the seed coat bony, dull or rough, ca. 9–30 cells thick at narrowest point, covered with a thin layer of pulpy tissue when wet (or a glaze or crusty tissue when dry), with a C-shaped or curved cavity that opens by means of an operculum upon germination; *cells* of the hard seed coat surface elongate, overlapping, dense; *embryo* C-shaped to curved conforming to the seed's inner cavity, oily, the cotyledons short, usually reflexed, the hypocotyl much longer than the cotyledons.

KEY TO THE SPECIES OF *PSIDIUM* IN BAHIA, BRAZIL

1. Leaves linear, linear-oblanceolate, narrowly lanceolate, or narrowly oblong-lanceolate, mostly 4–9 times as long as wide.
    2. Leaves 1–3 mm wide, 1–2 cm long; young growth and inflorescences sparsely minutely puberulent to glabrous..... ***P. sp. nov. A***
    2' Leaves 15–46 mm wide, 5–16.5 cm long; young growth and inflorescences commonly covered with hairs.
        3. Leaves coriaceous, revolute; apex usually rounded to obtuse; calyx closed in bud; indumentum reddish brown; seeds 3 or 4, with rounded and flat sides. .. ***P. rotundidiscum***
        3' Leaves subcoriaceous, not revolute; apex usually acute; calyx open in bud; indumentum whitish or yellowish; seeds about 30 or more, angular. ..... ***P. riparium***
1' Leaves variously shaped but not linear, linear-oblanceolate, narrowly lanceolate, or narrowly oblong-lanceolate, mostly less than 3 times as long as wide.
    4. Calyx with (4–)5 evident flange-like or wart-like abaxial protrusions in bud.
        5. Leaves membranous to submembranous at anthesis; calyx lobe protrusions wart-like, apical, to ca. 0.5 mm long, rounded; disc to ca. 1.5 mm across; petals ca. 2 mm long; fruit ca. 6 mm long..... ***P. glaziovianum***
        5' Leaves submembranous to coriaceous at anthesis; calyx lobe protrusions subapical, flange-like, usually over 1 mm long; disc 3–5 mm across; petals 3–4 mm long; fruit 7–20(–30) mm long.
            6. Flange-like protrusions of calyx elongate, acute; leaf blades submembranous to subcoriaceous, the venation clearly visible; hairs if present up to 1.5 mm long; peduncles 3–5 mm long; bracteoles linear to linear-elliptic, 5–8 mm long, 0.2–1.2 mm wide. ..... ***P. appendiculatum***
            6' Flange-like protrusions of calyx rounded; leaf blades thickly coriaceous, the venation indistinct; hairs if present ca. 0.2 mm long; peduncles 8–15 mm long; bracteoles linear-filiform, 1.5–5 mm long, 0.1–0.2 mm wide..... ***P. schenckianum***
4. Calyx without evident protrusions in bud.
    7. Inflorescences borne on stems or trunks in clusters of as many as 20; calyx in bud closed except for an apical pore, with hairs sometimes protruding from pore, tearing irregularly at anthesis; fruit 1–2 cm in diam.; seeds few, ca. 6 mm long. ..... ***P. cauliflorum***

7' Inflorescences borne on young twigs in axils of leaves, or bracts, or at leafless nodes; calyx in bud closed or open, tearing irregularly or regularly (if regularly, then tearing into [4–]5 lobes or between lobes when present) at anthesis; fruits often larger than 2 cm in diameter; seeds often numerous, often smaller than 6 mm long.

8. Hypanthium and lower surface of at least young leaves densely covered with hairs, the hypanthium surface at anthesis usually obscured by hairs.

9. Calyx open, the lobes usually evident; tears sometimes forming between the (4–) 5 lobes.

10. Indumentum whitish; marginal veins not present proximally, arching broadly distally. ..... ***P. grandifolium***

10' Indumentum reddish brown, yellowish, or gray; marginal veins present throughout leaf, closely following the margins.

11. Shrub usually no more than 1.5 m high; hairs grayish, yellowish, or reddish brown, usually curled and tangled, obscuring the lower surface of mature leaves; midvein and lateral veins flat or slightly raised above; petiole 0–2(–3) mm long; calyx lobes triangular or subtriangular, 1–4 mm long ..... ***P. laruotteanum***

11' Shrub or tree to 8 m high; hairs mainly reddish brown, mostly erect, usually not obscuring the lower surface of mature leaves; midvein and often lateral veins impressed above; petiole (2–)3–9 mm long; calyx lobes mainly broadly rounded, 0.5–2 mm long (rarely triangular and up to 6 mm long)..... ***P. rufum***

9' Calyx closed in flower bud or open only as a terminal pore, tearing regularly or irregularly as the bud opens.

12. Leaves strongly revolute, elliptic to oblanceolate, usually about 3 times as long as wide; flower buds and young growth densely covered with reddish brown indumentum; seeds 3–4, 6–9 mm long. ..... ***P. rotundidiscum***

12' Leaves not strongly revolute, variously shaped, often less than 3 times as long as wide; flower buds and young growth various, often covered with whitish or yellowish indumentum; seeds 4 to over 200, 3–4 mm long.

13. Lateral veins usually more than 10; hairs on lower leaf surface appressed, whitish or silvery; plants commonly cultivated. ..... ***P. guajava***

13' Lateral veins usually less than 10; hairs on lower leaf surface not appressed, spreading or curled and tangled, usually yellowish brown or reddish brown; plants not cultivated (except rarely *P. guineense*).

14. Indumentum whitish; shrubs of grasslands and cerrado. ..... ***P. grandifolium***

14' Indumentum yellowish brown or reddish brown; shrubs or trees of various habitats.

15. Leaves 3–6.6 cm long, the lateral veins 4–6 pairs; seeds less than 8; known only from Mun. Anagé in caatinga. ..... ***P. sp. nov. B***

15' Leaves 4–11.5 cm long, the lateral veins 5–10; seeds over 20; widespread in many habitats, somewhat weedy. ..... ***P. guineense***

8' Hypanthium and lower leaf surface of leaves glabrous, thinly puberulent, or only sparsely covered with hairs, the hypanthium surface at anthesis visible under any hairs.

16. Calyx open, bowl-like, the lobes prominent or not in the bud.

17. Lateral veins connecting to a marginal vein only in distal half of leaf.

18. Leaves mainly less than 5 cm long; petals 2–5 mm long; flower buds 4–5 mm long; petiole 3–7 mm long; seeds 1–5. ..... ***P. rhombeum***

18' Leaves 5–12 cm long; petals 5–10 mm long; flower buds 5–12 mm long; petiole 0–4 mm long; seeds 6–50.

19. Lateral veins prominent, 4–8 pairs, leaving midvein at an angle of 30–45 degrees; blades drying olive-green to reddish brown; young twigs often 4-winged, usually square in section. ..... ***P. australe***

19' Lateral veins not prominent, 5–12 pairs, leaving midvein at angle of 45–60 degrees; blades drying chocolate brown; young twigs compressed to terete, sometimes with longitudinal ridges. ..... ***P. myrsinites***

17' Lateral veins connecting to a marginal vein from near base to apex (or the lateral and marginal veins obscure in *P. ganevii*).

20. Calyx with a sinuate margin, the lobes not distinguishable.
    21. Leaves usually less than 4 cm long, the apex often emarginate; lateral veins obscure; seeds up to ca. 10, 7–8 mm long; style 8–10 mm long. ... ***P. ganevii***
    21' Leaves usually over 4 cm long, the apex not emarginate; lateral veins visible, often prominent; seeds 15 or more, 3–8 mm long; style 6–14 mm long.
        22. Calyx bowl extending 3–6(–8) mm beyond the ovary summit; style 10–14 mm long; petals 10–12 mm long; leaves usually widest at the middle or below; petiole 1–3 mm long..... ***P. striatulum***
        22. Calyx bowl extending 1–2 mm beyond the ovary summit (the lobes usually evident upon close inspection as 5 areas of pubescence on inner calyx surface); style 6–8 mm long; petals 5–8 mm long; leaves usually widest at the middle or above; petiole 0–1 mm long..... ***P. myrsinites***
20' Calyx with clear, well-developed lobes.
    23. Lateral veins leaving midvein at an angle of 30–45 degrees; leaves mainly less than 5 cm long; blades submembranous to chartaceous; petals 2–5 mm long; flower buds 4–5 mm long..... ***P. rhombeum***
    23' Lateral veins leaving midvein at an angle of 45–90 degrees; leaves frequently over 5 cm long in some species; blades in some species coriaceous; petals 3–11 mm long; flower buds 4–12 mm long.
        24. Leaves mostly obovate to oblanceolate, the blades subcoriaceous to coriaceous.
            25. Marginal vein closely following the margin; lateral veins prominent; calyx lobes obtuse to rounded. ..... ***P. salutare*** var. ***pohlianum***
            25' Marginal vein arching between the laterals, not closely following the margin; lateral veins not prominent; calyx lobes rounded. ..... ***P. myrsinites***
        24' Leaves mostly elliptic, ovate, or lanceolate, the blades chartaceous to subcoriaceous.
            26. Calyx lobes triangular, 2–7 mm long; leaf blades stiffly coriaceous at maturity.
                27. Shrub to about 1 m high; leaves usually ovate to elliptic 3.7–13 cm long; flower bud 8–10 mm long; calyx lobes 4–5 mm wide; peduncle 1–2.5 mm wide; disk 6–7 mm across; ovary 3–5-locular, the inner locule surface puberulent; fruit to ca. 25 mm in diameter; seeds ca. 3 mm long. ..... ***P. firmum***
                27' Shrub or tree to 10 m high; leaves usually elliptic, obovate or oblanceolate, 4–9 cm long; flower bud 4–7 mm long; calyx lobe 2–3(–4) mm wide; peduncle 0.5–0.8 mm wide; disk 3–4(–5) mm across; ovary 2–3-locular, glabrous within; fruit to ca. 10 mm in diameter; seeds 4–8 mm long. ..... ***P. salutare*** var. ***pohlianum***
            26' Calyx lobes absent or obscure, normally less than 1.5 mm long; leaf blades not stiffly coriaceous.
                28. Leaves sessile to subsessile, oblong, oblong-oblanceolate, less often elliptic, the apex rounded to obtuse; blade drying chocolate brown and lustrous above, lighter brown below; lateral and marginal veins obscure, the marginal vein often evident only distally, arching broadly between laterals, within 0.5–6 mm of the margin; peduncles often over 1 cm long. ..... ***P. myrsinites***
                28' Leaves sessile to petiolate, mainly elliptic, ovate or lanceolate, the apex often acute to acuminate; blade drying green to brown, usually dull above (somewhat lustrous sometimes in *P. brownianum*), usually not lighter below; lateral and marginal veins obscure or prominent, the marginal vein evident throughout leaf, not arching broadly between laterals, running

more or less parallel to the margin, within 0.5–3 mm of the margin; peduncles mostly less than 1 cm long.
29. Leaves mostly widest below the middle; base usually obtuse to cordate; petiole 0–4(–5) mm long..... ***P. brownianum***
29' Leaves usually widest at the middle or above; base usually acute to acuminate; petiole 3–13 mm long..... ***P. myrtoides***

16' Calyx closed or with only a terminal pore, the lobes usually not notable in the flower bud.
30. Leaves suborbicular to oblong-orbicular (rarely over 2 times as long as wide), sessile or subsessile, the apex rounded or emarginate; sandy habitats near ocean..... ***P. amplexicaule***
30' Leaves elliptic, ovate, obovate, oblanceolate (often over 2 times as long as wide), petiolate (except sometimes for *P. brownianum*), the apex various; habitats various.
31. Blades membranous at anthesis, the tertiary venation clearly visible; buds 5–6 mm long, the closed calyx rostrate, the inner surface of calyx hirsutulose; petiole with a protrusion below the point of attachment..... ***P. sp. nov. C***
31' Blades coriaceous at anthesis, the tertiary veins obscure or distinguishable; buds generally over 6 mm long, the closed calyx not rostrate, the inner surface glabrous to puberulent; petiole without a protrusion below the point of attachment.
32. Stamens attached to inner surface of the calyx tube; tears cutting into the staminal ring as the flower opens; leaf apex often acute to acuminate.
33. Leaves generally widest above or at the middle; seeds usually more than 15, rounded; stamens 200–400; stigma much wider than style, 1–1.5 mm wide ..... ***P. cattleyanum***
33. Leaves generally widest below or at the middle; seeds generally less than 10, with rounded and flat sides; stamens 80–220; stigma about as wide as style, less than 0.5 mm wide. ..... ***P. oligospermum***
32' Stamens attached to the summit of the ovary; tears not penetrating the staminal ring as the flower opens; leaf apex various.
35. Leaves usually less than 5 cm long, the apex often emarginate; venation often obscure; seeds 5–10, 7–8 mm long; caatinga and savanna; central Bahia..... ***P. ganevii***
35' Leaves usually over 5 cm long, but if less than 5 cm long, then the leaf apex not emarginate; venation usually clearly visible; seeds often more than 10, 3–7 mm long; habitat and distribution various.
36. Leaf apex usually rounded to obtuse; marginal vein indistinct, lacking or present only distally; petals 7–14 mm long; anthers 1–3.5 mm long; seeds about 30 to 300.
37. Leaves, twigs and flowers usually abundantly pubescent; tertiary veins usually predominantly ladder-like; calyx closed completely or nearly closed and with 5 minute lobes at the apex; disturbed habitats or occasionally cultivated..... ***P. guineense***
37' Leaves, twigs and flowers glabrous or very sparsely pubescent; tertiary veins often predominantly reticulate, but ladder-like veins common; calyx nearly closed and with 5 minute lobes at the apex; habitats frequently wet. ..... ***P. nutans***
36' Leaf apex acute to acuminate; marginal vein present for entire leaf length; petals 2.5–6 mm long; anthers 0.3–1 mm long; seeds up to ca. 20.
38. Leaves elliptic to ovate-lanceolate, mostly less than 5 cm long, the base acute to rounded, the petiole 1–6 mm long; lateral veins leaving the midvein at an angle of about 45 degrees or less; fruit subglobose to pyriform. ..... ***P. oligospermum***
38' Leaves ovate to lanceolate, often over 5 cm long, the base usually rounded to subcordate, the petiole 0–4 mm long; lateral veins leaving the midvein at an angle greater than 45 degrees; fruit globose.

39. Peduncles over 10 mm long, borne on axillary bracteate shoots with a rachis 1.2–2.5 cm long, or solitary in the axils or leaves or at leafless nodes; ovules per locule 28–33; fruit 15–30 mm long; seeds 15–20; anthers ca. 1 mm long. .... ***P. bahianum***

39' Peduncles usually less than 10 mm long, solitary in the axils of leaves or at leafless nodes, or if borne on axillary bracteate shoots, these with a rachis less than 1 cm long; ovules per locule 6–25; fruit 6–15 mm long; seeds 2–12; anthers 0.3–0.5 mm long..... ***P. brownianum***

1. ***Psidium amplexicaule*** Persoon, Syn. 2: 27. 1806. TYPE. [St. John's], "Antillis." *Richard s.n.* (HOLOTYPE: P [Jussieu herbarium], =MICH neg. 1965. ISOTYPES: F-76377!, P-258489!, P-258490!) Other possible original material at P, P-258491! [perhaps from Tortula], [P-258492! from Guadalupe Island).

Psidium cordatum Sims, Bot. Mag. 43: t. 1779. 1815. TYPE. "Communicated by A. B. Lambert, Esq. from his collection at Boyton, who raised it from seeds received from late James Tobin, Esq. the produce of a tree in the Island of St. Nevis, in the West-Indies." (HOLOTYPE: K-170084).

Guajava amplexicaulis (Persoon) Kuntze, Rev. Gen. 240. 1891.

Psidium harrisianum Urban, Symb. Ant. 7: 294. 1912. TYPE. Jamaica, "supra Clarendon in sylvis Peckham dictis, 800 m. alt.," *Harris 11000* (HOLOTYPE: B, lost. ISOTYPE: NY-1288054!).

Psidium dumetorum Proctor, Bull. Inst. Jam. Sci. Ser. no. 16: 37. 1967. TYPE. Jamaica, Clarendon, Mason River Savana, 2.75–3 mi due NW of Kellits P.O., 2300 ft, *Proctor 19650* (HOLOTYPE: IJ. ISOTYPE: LL-372190).

Psidium sessilifolium Alain, Phytologia 25(5): 270. 1973. TYPE. Dominican Republic, "Arroyo Frances, Puerto Plata, 50–100 m," 28–29 Oct 1969, *Liogier 16557* (HOLOTYPE: NY-1288089!). *Liogier 16145* (ISOPARATYPE: BM!).

Calyptrogenia biflora Alain, Moscosoa 1(1): 28. 1976. TYPE. Domincan Republic, Sierra Prieta, Villa Mella, 150 m, *Liogier and Liogier 21467* (SYNTYPES: SDM [sic; presumably USD or JBSD], NY-84484. ISOSYNTYPE: GH-68944).

Marlierea leal-costae G. M. Barroso and Peixoto, Revista Brasil. Bot. 18(1): 105. 1995. TYPE. Brazil, Bahia, Salvador, Dunas de Itapoá, entre o aeroporto e Stella Maris, 20 Oct 1974, *A. Leal Costa et W. Santana s.n.* (HOLOTYPE: ALCB 03038, not seen online). Paratype from type locality, 30 Nov 1969, *A. Leal Costa 37* viewed as an online image (http://www.alcb.ibio.ufba.br/images/tipos/DSC00243.JPG).

Shrub 1–2 m high, glabrous except for puberulent disk and calyx within; *hairs* minute (less than 0.1 mm long), reddish brown to white; *young twigs* reddish to gray, smooth or longitudinally striate. LEAVES suborbicular, oblong, elliptic, or ovate, 2.4–7.5 cm long, 2–7 cm wide, 0.9–1.8 times as long as wide, glabrous; *apex* rounded, or obtuse, often emarginate; *base* rounded to cordate; *petiole* essentially none, or 1–2 mm long, glabrous; *venation* brochidodromous, the midvein flat above, prominent below, the lateral veins 5–8 pairs, leaving the midvein at an angle of 60° to nearly 90°, moderately prominent to obscure, straight or somewhat recurved, the marginal vein broadly arching between the laterals, within 1–7 mm of the margin, the tertiary veins dendritic, usually appearing to arise from the marginals, alternating with the laterals; *blades* coriaceous, drying gray-green to dark reddish brown, slightly lighter below than above, lustrous above. FLOWER BUDS pyriform, 6–12 mm long, glabrous, the hypanthium obconic, cylindrical or campanulate, 3–5 mm long, the distal portion of bud subglobose to obovoid, 4–9 mm long; *indumentum pattern of buds* with all surfaces glabrous or the disk and/or calyx within minutely (usually appressed) puberulent; *peduncles* 1–3-flowered, solitary, borne in the axils of leaves, 6–25 mm long, glabrous; *bracteoles* linear to narrowly triangular, ca. 0.5–1 mm long. CALYX closed entirely, sometimes with an apiculate apex, or enclosing the corolla except for an apical pore, tearing irregularly at anthesis, puberulent within, the tears cutting deeply into the staminal ring; *petals* suborbicular 10–15 mm long; *stamens* 150–270, 8–10 mm long; *anthers* 0.8–1 mm long, with a large terminal gland and 2–22 smaller glands below; *style* ca. 6–8 mm long, glabrous; *ovary* 2–4-locular; *ovules* 15–44 per locule, 1–2 seriate on edge of a peltate placenta. FRUIT subglobose, 1–2 cm in diam.; *seeds* (1–) 6–16, 4–7 mm long, with some flat surfaces. (Fig. 5).

Representative specimens examined. Camaçari, apos a Tibras, ca. 12.8°S, 38.2°W, 12 Sep 1992 (fl), *Guedes s.n.* (ALCB, CEPEC); **Salvador**, Ca. 30 km a N do centro da cidade, estrada para o aeroporto, arredores de Itapuã, 12.9711°S, 38.5106°W, 23 May 1981, *A. M. V. de Carvalho et al. 707* (CEPEC, NY); **Salvador**, 3 km de la ciudad de Salvador, al oeste del aeropuerto, 12.9711°S, 38.5106°W, *R. Callejas Posada 1733* (CEPEC, NY).

Phenology—Flowering in September.

Habitat and Distribution—Apparently widespread in the Caribbean islands and disjunct along the coast of Bahia, Sergipe and perhaps others states of Brazil. In Brazil apparently found only in "restinga" (sandy coastal habitats) near sea level. In the Caribbean often growing well away from coast at elevation of over 400 m. This species appears to belong to a complex of a few Caribbean species that still requires further study.

Distinguishing Features—An essentially glabrous shrub 1–2 m high of restingas; leaves suborbicular to oblong, 0.9–1.8 times as long as wide, sessile or subsessile, the base rounded to cordate; lateral veins leaving the midvein at an angle of 60° to nearly 90°; anthers with a terminal gland and smaller glands below; seeds 4–7 mm long. Perhaps most similar to *Psidium cattleyanum*, which is also nearly glabrous and may sometimes be found in similar habitats. *Psidium cattleyanum* differs in having: predominately obovate to oblanceolate (vs. suborbicular to oblong in *P. amplexicaule*) leaves with petioles 2–14 mm long (vs. 0–2 mm long); lateral veins that leave the midvein at angle of 45–60° (vs. 60–90°); and anthers with a single terminal gland (vs. a terminal gland and 2–22 smaller glands).

2. ***Psidium appendiculatum*** Kiaerskou, Enum. Myrt. bras. 32, pl. 3, fig. d-e. 1893. TYPE. Brazil. "Garanhuus [Garanhuns] Prov. Pernambuco," *Schenck 4221* (HOLOTYPE: C-10015949).

Shrub 1.5–3 high, glabrous to sparsely or densely covered with hairs, the indumentum mainly of a villous to pubescent type; *hairs* whitish to yellowish, up to ca. 1.5 mm long, spreading or somewhat appressed, straight to slightly curled; *young twigs* terete to slightly compressed, moderately to densely pubescent, the young bark gray to light brown, the older twigs becoming striate or flaky. LEAVES elliptic, oblanceolate, or obovate, 2–7.2 cm long, 1.6–3.2 cm wide, 1.2–3.6 times as long as wide, moderately to sparsely covered with hairs below, less densely so above; *apex* acute, acuminate or rounded, often apiculate; *base* cuneate; *petiole* 2–3 mm long, ca. 1 mm wide, densely hairy to subglabrous; *venation* brochidodromous, the midvein nearly flat above, prominent below, the lateral veins 6–8, obscure to prominent, leaving midvein at ca. 45 degree angle, impressed to nearly flat above, alternating with weaker (sometimes scarcely visible) dendritic veins that arise from adjacent larger veins, the marginal vein arching between laterals, nearly equaling them in prominence, approaching to within 1 mm of the margin; *blades* subcoriaceous, usually drying dark reddish brown to blackish. FLOWER BUDS (discounting calyx appendages) pyriform, 4–6 mm long, the hypanthium obconic to campanulate, 2–3 mm long, the distal portion of bud subglobose, 2–3 mm long; *indumentum pattern of buds* with all surfaces glabrous or all surfaces villose-pubescent to puberulent except for the glabrous style and petals and sometimes calyx base within; *peduncles* 3–5 mm long, 0.5–1 mm wide; *bracteoles*

linear to linear-elliptic, 5–8 mm long, 0.2–1.2 mm wide. CALYX nearly enclosing the corolla in the closed bud, the lobes with two distinct parts, a clasping base that is connate along its edges with adjacent lobes, and a flange-like apical appendage, the connate bases, tearing between the lobes at anthesis, after anthesis the subrectangular bases, 2–3 mm long, the tears cutting into the staminal ring, the flange-like appendages, ascending, laterally compressed, 2–4 mm long, sharply acute; *petals* suborbicular, ca. 4 mm long, glandular; *disk* ca. 3 mm wide (5 mm in fruit); *stamens* 177–250, ca. 5 mm long; *anthers* ca. 0.4 mm long, eglandular or with a single terminal gland; *style* ca. 5 mm long; *ovary* 2–3-locular; *ovules* 15–29 per locule, uniseriate or biseriate on margin of peltate placenta, reflexed. FRUIT subglobose, 1–1.5 cm in diam.; *seeds* 7–17, 2.5–6 mm long, with flat and rounded sides. (Fig. 6).

Representative specimens examined. Abaíra, Brejo do Engenho, 13.3°S, 41.8°W, 950–1000 m, 30 Dec 1991(fl), *Nic Lughadha et al. H-50564* (ASU0005177, HUEFS); **Caetité**, Serra Geral, 1.5 km S of Brejinhos das Ametistas, 14.15°S, 42.141389°W, 900 m, 11 Apr 1980 (fr), *Harley 21251* (ASU0005178, CEPEC); **Iaçu**, Lage Preta, 12.8403°S, 39.9703°W, 380 m, 20 Feb 2005 (fr), *França et al. 5120* (ASU0005181); **Itanagra**, Faz. Quebrado, 12.26°S, 38.04°W, 28 Nov 1992 (fl), *Guedes et al. 2665* (ALCB, SP); **Itatim**, Morro das Tocas, 12.7167°S, 39.7 W), 310– 430 m, 16 Dec 1995 (fl), *Melo et al. 1373* (HUEFS); **Licínio de Almeida**, 14.651778°S, 42.546694°W, 930 m, 29 Oct 2012 (fr), *Stadnik 111* (photos-ASU0075033); **Maracás**, 7 km ao SO de Maracás na estrada para Contenadas do Sincorá, 13.5°S, 40.5°W, 820 m, 23 Mar 1988 (fr), *Ginzbarg et al. 849* (ASU0005186, CEPEC); **Morro do Chapéu**, N de Morro do Chapéu, 11.6153°S, 41.0225°W, 915 m, 1 May 1999 (fr), *França et al. 2808* (ASU0005184); **Mucugé**, Guiné, 12.8653°S, 41.5069°W, 1080 m, 15 Feb 1997 (fr), *Santos et al. 5725* (K); **Palmeiras**, caminho para Serra Preta, 12.531944°S, 41.587222°W, 800 m, 28 Mar 2003 (fr), *Melo et al. 3632* (HUEFS); **Poções**, km 10 da estrada que liga Poções (BR-116) ao povoado de Bom Jesus da Serra [14.47°S, 40.42W], 750 m, 5 Mar 1978 (fr), *Mori et al. 9524* (CEPEC, NY); **Rio de Contas**, Estrada Real, parte no meio, 13.53°S, 41.95°W, 2 Jan 2000 (fr), *Giulietti et al. 1649* (ASU0005182); **Santa Brígida**, Raso de Catarina, 9.58306°S, 38.49139°W, 611 m, 28 Jun 2002, *Queiroz et al. 7283* (ASU0057317); **Santa Inês**, ca. 17 km de Santa Inês, na estrada em direção a Cravolandia, na entrada para a Serra de Zé do Coito, 13.3072°S, 39.8133°W, 480 m, 25 Apr 1002 (fr), *Souza et al. 248* (ASU0005181).

Phenology—Flowering from October to December; fruiting throughout the year but mainly from January to May.

Habitat and Distribution—Found from northern Minas Gerais to Pernambuco, but mainly in Bahia in Brazil. Also found on Isla Margarita off the northern coast of Venezuela. In Bahia found in caatinga and forest, on slopes of inselbergs, near rivers, and in sandy or rocky soils. Found at elevations of 280–1200 m.

Distinguishing Features—The most distinctive structure of *Psidium appendiculatum* is the calyx; each lobe has two distinct parts, a clasping base that is connate along its edges with adjacent lobes, and a flange-like apical appendage. It is most similar to *P. schenckianum* and is compared with that species in couplet 6 of the key. I have found one hybrid between these species (*Nic Lughadha et al. 50569* at HUEFS) in Mun. Abaíra at Brejo de Engenho.

3. ***Psidium australe*** Cambess., in A. St.-Hil., Fl. Bras. Merid. 2: 283. 1833. TYPE. BRAZIL. "Prope vicum vulgo Capella de Sta. Maria ad fines provinciarum Rio Grande de S. Pedro do Sul et Missionum." *Saint-Hilaire s.n.* (HOLOTYPE: P-258487!).

Guajava australis (Cambess.) Kuntze, Rev. Gen. Pl. 1: 239. 1891.

Psidium triphyllum Barb. Rodr., Myrt. Paraguay 12. 1903. TYPE. Paraguay. "Ipê-hú... Sierra de Maracayu." *Hassler 4990* (HOLOTYPE: G-194094).

Psidium mucronatum Barb. Rodr. ex Chodat and Hassl., Bull. Herb. Boissier 7: 798. 1907. TYPE. Paraguay. "Ipé-hu Sierra de Maracayu." *Hassler 5082* (SYNTYPES: G [4 sheets, =ASU photos]. ISOSYNTYPES: NY!, P-258433!).

Psidium piribebuiense Barb. Rodr. ex Chodat and Hassl., Bull. Herb. Boissier 7: 797, 1907, TYPE. Paraguay. "Cordillera de Piribebuy." *Hassler 6632* (SYNTYPES: G [2 sheets, =ASU photos!]. ISOSYNTYPES: MICH-1210425!, NY-1288078!, P-258395!, P-258396!, S-r-9457, W-762). [Annotated as *P. australe* var. *australe* but also similar to var. *suffruticosum*].

?***Psidium emilhasslerianum*** Barb. Rodr. ex Chodat and Hassl., Bull. Herb. Boissier 7: 799. 1907. TYPE. Paraguay. "pr. Tacuaral." *Hassler 1330* (SYNTYPES: G [2 sheets, = ASU photos]) and "Cordillera de Alto." *Hassler 1258* (SYNTYPES: G [2 sheets, =ASU photos]).

Psidium submetrale McVaugh, Mem. New York Bot. Gard. 18: 261. 1969. TYPE. VENEZUELA. "Bólivar: Entre San Félix y Puerto Ordaz..., elev 20 m, 26–27 Jun 1964 (fl)." *Steyermark 94275* (holotype MICH-1210421!).

Shrub or subshrub to ca. 1(–1.5) m high, essentially glabrous (except for inner calyx lobe surface), subglabrous to densely hairy on young growth, sometimes densely covered with appressed hairs on lower leaf surfaces, arising from a fire resistant underground stem; *hairs* whitish, appressed, to ca. 0.5 mm long; *young twigs* usually square in cross section, with four wings, reddish brown to gray-green, glabrous to moderately pubescent, glandular, with age the bark becoming gray to light brown, the bark flaking off to reveal smooth reddish brown to gray bark. LEAVES obovate, oblanceolate, narrowly elliptic, or elliptic, 3.5–11 cm long, 1.3–6 cm wide, 1.6–5.4 times as long as wide, glabrous to moderately pubescent, sometimes densely pubescent below; *apex* round, truncate, to acute, less often with a cuspidate tip; *base* cuneate, acute, acuminate, or rounded; *petiole* shallowly channeled, 0–4 mm long, 1.2–2 mm wide; *venation* usually eucamptodromous proximally to brochidodromous distally, the midvein impressed to flat above, prominent below, the lateral veins usually 4–8, leaving the midvein at an angle of 30–45°, a clear marginal vein not present, the tertiary veins obscure or forming an irregular reticulate pattern; *blades* coriaceous to subcoriaceous, drying light to dark olive green to dark reddish brown, usually darker above than below, lustrous or dull above. FLOWER BUDS pyriform to obovoid, 5–10 mm long, the hypanthium campanulate to obconic, 2–4 mm long, the distal portion of bud subglobose, 3–6 mm long; *indumentum pattern of buds* with all parts essentially glabrous or with peduncles, bracteoles, hypanthium, calyx without, calyx distally within, and disk sparsely to moderately appressed pubescent, with petals, disc, and style glabrous or with scattered hairs; *peduncles* 1-flowered or 3-flowered, 0.1–3.7 cm long, 0.8–1.5 mm wide, the arms of the dichasia 2–13 mm long; *bracteoles* narrowly deltoid-lanceolate, 1–3 mm long, clasping the hypanthium, usually falling before anthesis. CALYX broadly open and bowl-like [or nearly enclosing the corolla except for an apical pore in *P. australe* var. *suffruticosum* (O. Berg) Landrum, which is not found in Bahia], with deltoid lobes along the edge of the tube or merely with a sinuate margin, the lobes before anthesis to ca. 1 mm long, to ca. 3 mm wide; *petals* obovate to suborbicular, elliptic, oblanceolate, 7–10 mm long, glabrous; disk 5–10 mm across; *stamens* 100–300, 6–10 mm long, reflexed in bud so that anthers reach the disk; *anthers* 0.5–0.8 mm long, with 1 apical gland in the connective; *style* 5–8 mm long, the stigma somewhat peltate; *ovary* 3–4-locular, usually with a central hollow area; *ovules* 20–95

per locule, the placenta axile but not peltate, hidden by ovules, sometimes partially parietal when locules are not completely fused. FRUIT globose to subpyriform, 1.5–3 cm long; *seeds* subreniform, 3–5 mm long, rounded, 6–50. $2n = 44$. (Fig. 7).

Representative specimens examined. Abaíra, distrito de Catolés, Serra do Porco Gordo-Gerais do Tijuco, 13.4°S, 41.75°W, 1250 m, 24 Apr 1992 (fl), *Ganev 179* (HUEFS); **Caitité,** Serra Geral de Caitité, ca 5 km S from Caitité along the Brejinhos das Ametistas Rd., 14.117°S, 42.483°W, 1000 m, 9 Apr 1980 (fr), *Harley et al. 21143* (CEPEC); **Rio de Contas**, 10 km N of town of Rio de Contas on road to Mato Grosso, 13.47°S, 41.83°W, 1000 m, 19 Jan 1974 (fr), *Harley 15292* (CEPEC).

Phenology—In Brazil mainly flowering in November and December (less often in October, January, and February) and fruiting from January to April.

Habitat and Distribution—Found from Venezuela and the Guianas to northeastern Argentina. Cerrado, campos, gallery forest. This is a common species of campos and cerrados of Minas Gerais, São Paulo, Paraná, and Paraguay. Found at elevations of 290–1250 m.

Distinguishing Features—Calyx bowl-like, not closed; hypanthium and lower leaf surface of leaves glabrous, thinly puberulent, or only sparsely covered with hairs; young twigs often 4-winged; leaves often obovate to oblanceolate. It is most likely to be confused with *P. grandifolium*, with which it seems to hybridize in southern Brazil. I reproduce a key here modified from Landrum (2005) that distinguishes them. Both these species are relatively rare in Bahia.

1. Flower bud just before anthesis 6–15 mm long, densely lanate, the underlying surface of hypanthium hidden, the calyx usually nearly closed; leaves whitish lanate below, generally at least some widest near the middle. ..... ***P. grandifolium***

1' Flower bud just before anthesis 5–10 mm long, moderately covered with hairs to glabrous, the underlying surface of hypanthium visible through hairs (if present), the calyx open; leaves glabrous to densely short pubescent below, generally widest above the middle..... ***P. australe***

I have treated *Psidium australe* (Landrum 2005) as a variable species of three varieties. In Bahia I believe that only *P. australe* var. *australe* is present. *Psidium australe* var. *suffruticosum* (not known from Bahia) is especially strong and I have occasionally recognized it, as have previous workers, as a separate species. Since my publication, Proença and Soares-Silva (Proença et al. 2011) have described *Psidium ratterianum* in this complex. I think it is closely related to *P. australe* but probably sufficiently different to recognize, apparently having an unusual combination of characters (amphistomatic leaves, persistent bracteoles, ascending leaves, and quite strong venation).

Psidium submetrale, I include within *P. australe* var. *australe*. It differs in the tearing of the calyx—irregular, not in 5 nearly equal lobes.

Costa and Forni-Martins (2006) report $n = 22$ (*Costa 496*) $2n = 44$ (*Costa 509*) for this species using the name *Psidium cinereum* (here considered a synonym of *P. grandifolium*). C. Proença subsequently has identified both as *P. australe* according to SpeciesLink (2017).

4. *Psidium bahianum* Landrum and Funch, Novon 18(1): 74. 2008. TYPE. Brazil. Bahia: Alagoinhas, Campus II/UNEB, Rod. Alagoinhas–Salvador, km 03, 12°11'S, 38°25'W, 11 Oct. 2001 (buds), *N. G. Jesus 1384* (holotype, HUEFS, photos at ASU, MO).

Tree up to 25 m high, essentially glabrous except for sparsely to densely puberulent inner surface of calyx and disk; *young twigs* reddish brown to gray, becoming only slightly rough with age. LEAVES ovate, lanceolate, or elliptic, 3.5–14 cm long, 3.2-6.5 cm wide, 1–2.3 times as long as wide; *apex* usually acuminate, less often acute or obtuse, often turned to one side in pressing; *base* obtuse or rounded; *petiole* 2–8 mm long, 2–3 mm thick, unchanneled or slightly channeled distally; *venation* brochidodromous; *midvein* about flat to raised slightly above, prominent below, the lateral veins weak, 7–12 pairs, usually leaving the midvein at an angle greater than 45°, a weaker marginal vein arching between laterals to within 1–4 mm of the margin, the weaker tertiary veins dendritic; *blades* coriaceous, drying gray-green to dark reddish brown, often lustrous above. FLOWER BUDS pyriform, 4–8 mm long, glabrous, borne in axillary bracteate shoots of ca. 3 nodes and with a rachis 1.2–2.5 cm long, or solitary in leaf axils or at leafless nodes, the hypanthium obconic, 2–4 mm long, somewhat sulcate when dry, the distal portion of bud subglobose, 3–4 mm long, the bracteate shoots occasionally terminating in a leafy node; *indumentum pattern of buds* with peduncles, bracteoles, hypanthium, calyx without, petals, and style glabrous, and with calyx within and disk sparsely to densely puberulent; *peduncles* uniflorous, 12–34 mm long, 1–2 mm wide; *bracteoles* narrowly triangular, ca. 1.5 mm long, glabrous or ciliate. CALYX closed or with a small apical pore, tearing irregularly at anthesis, the tears not (or scarcely) penetrating the staminal ring; mature *petals* unknown; disk ca. 5 mm across after anthesis; *stamens* ca. 140, 6–9 mm long; *anthers* ca. 1 mm long, with a terminal gland and sometimes another smaller gland below; *style* 6–8 mm long; *ovary* 3-locular; *ovules* 28–33 per locule. FRUIT subglobose, 15–30 mm long; *seeds* 15–20, 3–4 mm long, not angular. (Fig. 8).

Representative specimens examined. Alagoinhas, Campus II/UNEB, Rod. Alagoinhas–Salvador, km 03, 12.1856°S, 38.4225°W, 11 Oct. 2001 (buds), *Jesus 1384* (holotype, HUEFS, photos at ASU, MO); **Conde**, Fazenda do Bu, Mata do Fundão, 12.01417°S, 37.7172°W, 8 Nov. 1995, *Ferreira and Jost 831* (HUEFS); **Entre Rios**, Subauma, ponto 5, 12.2166°S, 37.8667°W, 8 Dec. 1982, *Araujo 371* (CEPEC, HRB); **Ilhéus**, km 50 da Rod. Ilhéus–Una, Est. da EMBRAPA (EDJAB), 16 Sep. 1993, *Jardim et al. 295* (SP); **Maraú**, ca. 7 km N do Povoado de Saquaíra, Peninsula de Maraú, 13.986111°S, 38.9506°W, 2 Feb. 2000, *Jardim et al. 2626* (F).

Phenology—Flowering October to December, with fruits from December to February (rarely September).

Habitat and Distribution—*Psidium bahianum* is found in restinga and forest at less than 200 m elevation and is apparently endemic to eastern Bahia, Brazil.

Distinguishing Features—This species is distinguished by being essentially glabrous and by its large leaves (to 14 cm long) that are coriaceous and lustrous, generally ovate in shape, and arching along their midvein. The leaf apices are usually acuminate and when the leaf is pressed flat, often turn to one side. The blade is enfolded longitudinally and often is pressed folded and hiding the upper surface. The calyx in the flower bud may be completely closed or have a terminal pore opening and is puberulent within. *Psidium bahianum* is contrasted in the key below with the widespread, common and weedy species *P. cattleyanum* Sabine, a native of the Atlantic Costal Forest of Brazil.

1. Tree to 25 m tall; leaves mainly widest somewhat below the middle, the blades arching longitudinally; peduncles 12-34 mm long, often borne in bracteate shoots; tears in calyx not or scarcely penetrating the staminal ring. ..... ***P. bahianum***
1' Tree to 10 m tall; leaves mainly widest above the middle, the blades not normally arching; peduncles 2-8 mm long, solitary; tears in calyx usually penetrating deeply into the staminal ring ..... ***P. cattleyanum***

5. *Psidium brownianum* DC., Prodr. 3: 236. 1828. TYPE. Brazil. "deserto Bahiensi [sylvis ad villam novam da Jacobina]." *Martius s.n.* (HOLOTYPE: M-146833, annotated by de Candolle).

Mitranthes browniana (DC.) O. Berg, in Martius, Fl. bras. 14(1): 355. 1857.
Psidium moritzianum O. Berg, Linnaea 27: 359. 1856. TYPE. Venezuela. "v. in hb. Berol., Sonder. et Vindob." "ad coloniam Tovar." *Moritz 1626* (SYNTYPE: W-48039!. ISOSYNTYPES: BM-953680, BM-953679, K-565592, K-565593, LE-6986, P-258413!, P-258414!) and *Karsten 91* (no specimens found).
Psidium macahense O. Berg, in Mart., Fl. bras. 14(1): 605. 1859. TYPE. Brazil. "prope Macahe, prov. Rio de Janeiro." *Riedel* [*304*]. (SYNTYPES: LE-6983, LE-6984, LE-6985. ISOSYNTYPES: F-65700, GH-71256, K-565507, NY-1288060!, P-258426!, U-5184).
Chytraculia browniana (DC.) Kuntze, Rev. Gen. 1: 238. 1891.
Guajava moritziana (O. Berg) Kuntze, Rev. Gen. 240. 1891.
Mitropsidium brownianum (DC.) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 486. 1941.

Tree or shrub 0.4–5 m high, glabrous to puberulent (sometimes minutely so) on young growth and flowers; *hairs* up to ca. 0.3 mm long, reddish brown to clear; *young twigs* light reddish brown, often puberulent, the bark smooth, the older twigs with smooth to flaky bark, usually gray. LEAVES ovate, lanceolate to lanceolate-oblong, 3–12 cm long, 2–6 cm wide, 1.5–2.3(–3.3) times as long as wide, densely glandular, the margins revolute; *apex* acute to acuminate, the tip often obtuse; *base* rounded, cordate, rounded or acute; *petiole* 0–4(–5) mm long, 0.7–2 mm thick, channeled or not; *venation* brochidodromous, the midvein impressed to nearly flat above, prominent below, the lateral veins 7–13 pairs, moderately prominent to obscure, leaving the midvein at an angle usually greater than 45°, the marginal veins arching between laterals, less prominent than laterals, mostly running 2–3 mm from margin, the tertiary veins forming a dendritic pattern that arises from the marginal vein, usually weak; *blades* subcoriaceous, drying reddish brown to gray-green. FLOWER BUDS pyriform to fusiform, often with a conical or apiculate apex, 4–10 mm long, glabrous or puberulent, borne in terminal or axillary bracteate shoots (of ca. 2 nodes and with a rachis up to ca. 3 mm long), or solitary in leaf axils or at leafless nodes, the hypanthium obconic to campanulate, 1.5–3 mm long, the distal portion of bud of bud subglobose, 2.5–7 mm long, with a rounded to conical or apiculate apex; *indumentum pattern of buds* with all surfaces glabrous except for puberulent disk and calyx within, or with all or some surfaces puberulent, or with bracteoles ciliate and/or petals ciliate; *peduncles* uniflorous, 2–30 mm long, ca. 1 mm wide, puberulent to glabrous; *bracteoles* triangular, often narrowly so, 0.5–2 mm long, often puberulent or ciliate, sometimes persisting until fruit matures. CALYX closed and apiculate or with a terminal pore-like opening (rarely open and bowl-like), tearing irregularly or somewhat regularly in ca. 4 lobes, the opening round to quadrangular; *petals* 4–5 (or sometimes numerous and apparently replacing stamens in apparently diseased flowers), 3–6 mm long; *disk*

quadrangular or round, puberulent, 3–5 mm wide; *stamens* 95–230, 4–6 mm long; *anthers* 0.3–0.5 mm long, with a solitary terminal gland or with a terminal and up to 17 smaller glands as well; *style* 4–7 mm long; *ovary* 2–3-locular; *ovules* 6–25 per locule, uniseriate on each edge of a slightly peltate placenta. FRUIT globose, 7–15 mm in diam.; *seeds* 2–12, 3–5 mm long, mainly rounded. (Fig. 9).

Representative specimens examined. Abaíra, Perto do riacho da quebrada ao pé da Serra do Atalho, 13.23°S, 41.83°W, 1100 –1300 m, 26 Dec 1991 (fl), *Harley 50439* (ASU0015706); **Barragem de Bananeiras**, Cachoeiras, Vale dos Rios, Paraguaçu e Jacuípe, 12.53°S, 39.0833°W, 40–120 m, Jun 1980 (fl), *Pedra do Cavalo 217* (ALCB, CEPEC, HUEFS); **Bonito**, estrada para Várzae do Cerco, 11.8933°S, 41.293611°W, 915–955m, 15 Jun 2003 (fr), *França et al. 4747* (HUEFS); **Campo Formoso**, Serra dos morgados, 10.2428°S, 40.2658°W, 819 m, 14 Apr 2006, *Santos 539* (ASU0005438); **Itororo**, Meio, 15.11667°S, 40.1°W, Jan 1991 (fl), *Sobral et al. 6744* (SP); **Iramaia**, estrada que liga Iramaia à Barra da Estiva, km 38, 13.5°S, 41.1667°W, 24 Mar 1988 (fl), *Ginzbarg et al. 867* (ASU0006087, CEPEC); **Itiruçu-Jaguaquara**, entroncamento, 13.5167°S, 40.0833°W, Jan 1988 (fl), *Sobral and Mattos Silva 5825* (CEPEC); **Jacobina**, Arredores Tombador, 11.0619°S, 40.6606°W, 875 m, 6 Sep 1999 (fr), *Melo et al. 2974* (ASU0015699); **Lençois**, Mata das Toalhas, 12.506944°S, 41.373056°W, 450 m, 26 Mar 2000 (fr), *Funch 1120* (HUEFS); **Maracás**, 2 km a E da cidade, depois do cruzeiro da cidade, Fazenda Juliana, 13.4142°S, 40.3936°W, 1016 m, 23 Apr 2002 (fr), *Souza et al. 184* (ASU0015700); **Morro do Chapéu**, ca. 10 km E de Morro na BA 052, 11.5983°S, 41.063°W, 984 m, 27 Aug 2006 (fl), *França and Lima 5535* (ASU0005440); **Morro da Torre**, 12.7167°S, 39.7°W, 330 m, 9 Nov 1996 (fl), *Melo 1827* (ASU0015696); **Mucugê**, estrada Mucugê-Barra da Estiva, ca. 16 km de Mucugê, 13.0722°S, 41.485°W, 1040–1108, 1 Feb 2003 (fl), *França et al. 4153* (ASU0015695); **Palmeiras**, Canoão de Lavrinhas, 12.574722°S, 41.574444°W, 1000 m, 29 Nov 2003 (fr), *França et al. 3688* (HUEFS); **Paulo Alfonso**, Reserva Ecol. do Raso da Catarina, 9.35°S, 38.233°W, 24 Jun 1982 (fl), *Guedes and Paganucci 448* (ALCB); **Pindobaçu**, estrada para o garimpo, Bairro Navo, 10.7533°S, 40.3847°W, 610 m, 12 Aug 1999 (fr), *Miranda 155* (ASU0015697); **Santa Cruz de Cabralia**, estrada que liga S. C. de Cabralia a Santo Andre, 16.25°S, 39.0167°W, 17 Jun 1980 (fl), *Mattos Silva and da S. Brito 869* (NY); **Santa Terezinha,** Serra da Jiboia, Morro da Pioneira, na descida da represa, 12.751389°S, 39.484722°W, 500–600 m, 3 Nov 2001 (fl), *Calvalho-Sobrinho et al. 71* (HUEFS); **Saúde**, Paulista, cachoeira do rio das Pedras, 1.5 km do povoado, 11.0067°S, 40.4467°W, 500 m, 12 Aug 1999 (fl, fr), *Miranda 118* (ASU0015707); **Seabra**, 4 km de Seabra, estrada Seabra-Barreira, 12.41861°S, 41.801944°W, 6 Aug 1966 (fl), *Araujo and Martins 1262* (SP); **Senhor do Bonfim,** Morro da Antena, ca. 11 km S de Senhor do Bonfim, 10.5517°S, 40.1444°W, 520–565m, 13 May 5 1999 (fl), *França et al. 2902* (ASU0015698); **Uruçuca** 7.3 km N of Serra Grande on rd to Itacaré, 14.41667°S, 39.01667°W, 6 May 1992 (fl), *Thomas et al. 9158* (CEPEC, RB); **Vitoria da Conquista**, ca. 2 km N de Vitoria da Conquista, via BR 116, Fazenda do Morro, prop Sr. Ubaldo, 16 Apr 1995 (fl), *França et al. 1230* (HUEFS).

Phenology—Flowering throughout year but mainly from December to June; fruiting mainly from February to June.

Habitat and Distribution—Cerrado, caatinga, forests, mata de cipó, riparian vegetation. Found from Rio de Janeiro to Pernabuco and Alagoas; also in northern Venezuela. Found at elevations of 40 to 1333 m.

Distinguishing Features—Leaves glabrous or nearly so, mostly ovate to lanceolate, usually sessile to subsessile, the lateral veins usually prominent and leaving the midvein at an angle greater that 45°.

This is a wide ranging and rather variable species in leaf shape, flower bud size, and calyx closure. Based on material I have seen: in Espirito Santo flower buds in this species seem to be small, 4-merous, with an apical pore in the calyx; and in Bahia the flower buds are small to large with a closed calyx, and 5-merous. According to the description of *P. moritzianum* of Venezuela, the calyx has 5 small lobes and the petals are 4. It is possible that the populations of Venezuela, Espirito Santo, and Bahia are

distinct enough to warrant some recognition, but I would need a larger sample size to be sure. I think that all three populations share many characteristics and as a group are distinct from other species.

I have found what I believe two cases of hybridization involving this species: one between *Psidium brownianum* and *P. ganevii* (*Ganev 3255* at HUEFS); and a second between *P. brownianum* and *P. schenckianum* (*Harley 19333* at ASU).

6. *Psidium cattleyanum* Sabine, Trans. Roy. Hort. Soc. 4: 315. pl.11. 1821. TYPE. Raised in England by William Cattley from seed from China. *Illustration: Trans. Roy. Hort. Soc. 4: 315. pl. 11. 1821.*

Psidium littorale Raddi, Alc. Sp. Pero: 6. Tab. 1, fig. 2. 1821. TYPE. Brazil. Rio de Janeiro. *Illustration: Alc. Sp. Pero: 6. Tab. 1, fig. 2. 1821.*

Psidium obovatum DC., Prodr. 3: 236. 1828. TYPE. Brazil. "campis prov. Sancti-Pauli." *Martius s.n.* (HOLOTYPE: M-32379 [annotated by de Candolle]).

Psidium buxifolium Nutt., N. Am. Sylva 1: 115; t. 25. 1842. TYPE. United States. "East Florida, near the river St. Johns." *Baldwyn s.n.* (possible HOLOTYPE: PHIL-22408).

Psidium sellowianum O. Berg, in Martius, Fl. bras. 14(1): 400. 1857. (Illegitimate superfluous name because *Psidium arboreum* Vell. is cited as a synonym.) TYPE. "Rio de Janeiro." *Sellow s.n.* (SYNTYPE: B, lost). *Gaudichaud s.n.* (SYNTYPE: B, lost; possible ISOSYNTYPES: P-258362!, P-258363!).

Psidium variabile O. Berg, in Martius, Fl. bras. 14(1): 400. 1857. (Illegitimate superfluous name because *Psidium cattleianum* Sabine and *P. littorale* Raddi are cited as synonyms.) TYPE. General statement on location of types includes B, M, MEL, W, Sprengel. Localities various—Minas Geraes: "Serra d'Itacolumi, haud longe a civitate Mariana." *St. Hilaire s.n., Widgren 1194.* São Paulo: "ad rivulum Itaque prope S. Paulo, prope Sumidor." *St. Hilaire s.n., Sellow s.n.* Santa Catarina: "in insula S. Catharinae" *Gaudichaud 233.* Rio Grande do Sul: *Sellow s.n.* Uruguay: *Sellow s.n.* (SYNTYPES: none found; possible ISOSYNTYPE: *Sellow s.n.* K-565483, mounted with a non-type, *Riedel 1170*)

Psidium coriaceum Mart. ex O. Berg, in Martius, Fl. bras. 14(1):401. 1857. (Illegitimate superfluous name because *Psidium humile* Vell. is cited as a synonym.) TYPE. "Rio de Janeiro." *Martius s.n.* (SYNTYPE B, lost; ISOSYNTYPE: M-32371), *Mikan and Schott 1048* (SYNTYPE: B, lost; ISOSYNTYPES: K-565482, W-46102!), *Sellow s.n.* (SYNTYPE: B, lost; ISOSYNTYPES: K-170080, K-170100, P-258444!), *Raben 752* (SYNTYPE: B, lost) and "São Paulo, prope Taubaté et Aldea de Escada." *Martius s.n.* (SYNTYPE: B, lost; ISOSYNTYPE: M-32372), *Sellow s.n.* (SYNTYPE: B, lost). All these specimens were cited by Berg under his *P. coriaceum* var. *obovatum*, which he considered to be the typical variety.

Psidium coriaceum var. ***obovatum*** O. Berg, in Martius, Fl. bras. 14(1): 401. 1857. Name to be replaced by the autonym *P. coriaceum* var. *coriaceum* because Berg cites *Psidium coriaceum* under this variety.

Psidium coriaceum var. ***grandifolium*** O. Berg, in Martius, Fl. bras. 14(1): 402. 1857. TYPE. Brazil. "in prov. S. Pauli." *Sellow s.n.* (HOLOTYPE: B, lost).

Psidium coriaceum var. ***longipes*** O. Berg, in Martius, Fl. bras. 14(1): 402. 1857. TYPE. Brazil. "in prov. S. Pauli." *Sellow* [*5875*] (HOLOTYPE: B, lost. ISOTYPES: K-170099, P-258443!).

Guajava cattleyana (Sabine) Kuntze, Rev. Gen. 239. 1891.

Guajava obovata (DC.) Kuntze, Rev. Gen. 239. 1891.

Guajava buxifolia (Nutt.) Kuntze, Rev. Gen. 240. 1891.

Psidium cattleyanum var. ***coriaceum*** Kiaerskou, Enum. Myrt. bras. 28. 1893.

Psidium cattleianum f. ***lucidum*** Degener, New Illustr. Fl. Hawaiian Islands [Fam. 273]. 1939. TYPE. United States. Hawaii. *Degener 12275* (HOLOTYPE: BISH?).

Psidium littorale var. ***longipes*** (O. Berg) Fosberg, Proc. Biol. Soc. Wash. 54: 180. 1941.

Psidium cattleianum var. ***littorale*** (Raddi) Fosberg, Occas. Pap. Bernice Pauahi Bishop Mus. 23:37. 1962.

Psidium ubatubense Mattos, Cienc. and Cult. 19: 332. 1967. TYPE. Brazil. "São Paulo." *Fontella and Moura 102* (HOLOTYPE: SP!, = http://cotram.org/collections/individual/index.php?occid=2785217&clid=0).

Shrub or tree to 1–12 m high, glabrous or the young growth puberulent to strigose on some floral structures; *hairs* whitish, most less than 0.1 mm long; *young twigs* flattened, becoming subterete, light reddish brown to light gray, the older twigs remaining more or less smooth, usually gray. LEAVES obovate, oblanceolate, elliptic, 3–10 cm long, 1.5–6.5 cm wide, 1.5–2.6 times as long as wide; *apex* acute, acuminate, to broadly rounded; *base* acuminate to cuneate, or rarely rounded; *petiole* channeled, 2–14 mm long, 1–2 mm wide; *venation* brochidodromous, the midvein prominent below, nearly flat to shallowly impressed above, the lateral veins 6–13 pairs, leaving the midvein at an angle of 45–60°, prominent to weak, flat or impressed above, the marginal vein arching between the laterals 1–5 mm from the margin, somewhat weaker than laterals, the tertiary veins dendritic, arising near the margin and extending towards the midvein; *blades* coriaceous (rubbery when fresh), drying light or dark reddish brown to gray-green, nearly concolorous, the upper surface after drying often mottled with whitish blotches, the margin slightly revolute. FLOWER BUD subpyriform, 5–14 mm long, the hypanthium obconic to funnel-form, 2–5 mm long, the distal portion of bud subglobose, 3–10 mm long; *indumentum pattern of buds* with all surfaces glabrous or with peduncles, bracteoles, and calyx within sometimes puberulent; *peduncles* 2–8(–13) mm long, ca. 1 mm wide, solitary, borne in the axils of leaves, at leafless nodes, or in the axils of leafy to reduced bracts; *bracteoles* ovate, lanceolate, or oblong, 1–2.3 mm long, caducous at anthesis. CALYX fused 3–7 mm beyond the ovary summit, terminating in a sinuate edged terminal pore or in 5 broadly rounded lobes (rarely closed and falling as a calyptra above staminal ring), tearing irregularly or between the lobes at anthesis, the tears cutting through the staminal ring; *petals* suborbicular, obovate to elliptic, 3–8 mm long; *disk* within the staminal ring ca. 4–6 mm across; *stamens* 200–400, 3–8 mm long; *anthers* 0.6–1 mm long, with 1 terminal gland; *style* 4–8 mm long, the stigma 1–1.5 mm wide; *ovary* 3–5-locular, sometimes with a few hairs on inside of locules; *ovules* 10–28 per locule, uniseriate or biseriate on each lamella, the placenta peltate, at least slightly so. FRUIT red or yellow, pyriform to subglobose, 1.5–3 cm long; *seeds* 12–64, 2–6 mm long, smooth, with rounded edges. $2n = 44, 88$. (Fig. 10).

Representative specimens examined. Belmonte, 15.85°S, 38.9°W, 31 Jan 1967 (yfr), *Belem and* Pinheiro 3230 (CEPEC, F, UB); **Caravelas,** Caravelas, ca 2 km a NE da cidade, na estrada para Ponta de Areia (17.75°S, 39.25 W), 5 Sep 1989 (fr), *Carvalho et al. 2449* (CEPEC); **Cairu**, Baixo Sul, 13.4833°S, 39.033°W, 15 Aug 1993 (fr), *Guedes s.n.* (ALCB); **Ibiquara**, Capão da Volta, 13.4°S, 41.3°W, 19 Sep 1984 (fr), *Hatschbach 48362* (ASU0006092, CEPEC); **Igrapiuna**, rodovia para Itubera (BA 001), Reserva de Michelin, Cachoeira de Pancada Grande, 13.7842°S, 39.1733°W, 2 Aug 2008 (fr), *Myrtaceae Class 66* (HUEFS); **Ilhéus**, Area do CEPEC, km 22 da Rodovia Ilhéus/Itabuna (BR 415), 50 m, 10 Jun 1986 (fr), *Hage and Santos 2054* (CEPEC, HRB); **Jussari**, Reserva Particular do Patrimonio Natural, entrada a 7,5 km na Rod. Jussari/Palmira, Faz. Teimoso, 1.7 km da entrada, 15.1545°S, 39.5312°W, 6 May 2000 (fr), *Carvalho et al. 6859* (ASU0006121); **Maracás**, 7 km SW Maracás nas estr. para Contendas do Sincora, 13.5°S, 40.5°W, 23 Mar 1988 (fr), *Ginzbarg 850* (ALCB, CEPEC); **Maraú**, estr. que liga Ponta do Muta (Porto de Campinhos) a Maraú, a 8 km do Porto, 14.1°S, 39°W, 6 Feb 1979 (fr), *Mori et al. 11418* (CEPEC); **Miguel Calmon**, Parque Estadual das Sete Passagens, proximo do parque, 11.3883°S, 40.535556°W, 1040 m, 4 Apr 2001 (fr), *Ribeiro et al. 105* (HUEFS); **Mucugê**, trilha para o Rumo, 13.2283°S, 41.2819°W, 1 May 1996, *Ferreira 1159* (ASU0006105); **Una**, ca. 9 km a E de Una, 15.3°S, 39.0667°W, 3 Dec 1981 (fl), *Carvalho and Lewis 879* (CEPEC).

Phenology—Flowering mainly from November to February; fruiting mainly from January to April.

Habitat and Distribution—Restinga, forest, campo, disturbed areas; frequently cultivated. Apparently native to eastern coastal Brazil in Mata Atlantica and restinga but now widely naturalized in tropical and subtropical regions worldwide. Found at elevations of from near sea level to 1450 m.

Distinguishing Features—Plants nearly glabrous, the leaves rubbery coriaceous, usually obovate to oblanceolate; calyx usually with a terminal pore, tearing irregularly on opening (rarely closed and calyptrate above the staminal ring), the tears cutting into the staminal ring.

Psidium cattleyanum is a variable species with respect to leaf and fruit size and fruit color. Chromosome numbers of $2n = 44$ and 88 have been reported. It can be an aggressive invader in some areas such as Hawaii but is also valued for its edible fruits and ornamental value. A more thorough study of its variation is certainly desirable.

7. ***Psidium cauliflorum*** Landrum and Sobral, Sida 22(2): 927. 2006. TYPE. Brazil. Bahia. Mun. Cachoeira, Morro Belo,Vale dos Rios Paraguaçu e Jacuípe, 39°05'W, 12 °32'S, 40–100 m, Dec 1980 (fl), *Grupo Pedra do Cavalo 955* (HOLOTYPE: HRB!. ISOTYPES: ALCB!, RB-542173, RB-557180).

Tree 3–5.5 m high, sparsely to densely pubescent on young growth; *hairs* rusty brown to whitish, mostly erect or spreading, up to ca. 1 mm long; *young twigs* terete to slightly compressed, densely to moderately pubescent, the bark reddish brown to gray, the older twigs gray, glabrous, the bark somewhat flaky. LEAVES elliptic to oval, 2.7–6.8 cm long, 1–3 cm wide, 1.8–2.6 times as long as wide, moderately to sparsely puberulent (or more densely so along midvein), glabrescent with age; *apex* acute; *base* rounded to cuneate; *petiole* channeled, densely to sparsely pubescent to glabrescent, 2–3 mm long, 0.5–1 mm wide; *venation* brochidodromous, the midvein impressed proximally to nearly flat distally above, prominent below, the lateral veins slightly raised and visible above or obscure, 6–9 pairs, leaving midvein at an angle of ca. 45°, the marginal vein arching between laterals, equaling them in prominence, running ca. 1–1.5(–3) mm from margin, the tertiary veins forming a dendritic pattern that arises from the marginal vein, scarcely to clearly visible; *blades* subcoriaceous, drying reddish brown to grayish, densely glandular beneath. FLOWER BUDS pyriform, often appearing apiculate, 4–6 mm long, densely pubescent on hypanthium, sometimes more sparsely so on calyx, borne on older stems in clusters of as many as 20, apparently appearing at the same point season after season, the hypanthium 1.5–3 mm long, obconic, the distal portion of bud subglobose, 2–3 mm long; *indumentum pattern of buds* with hypanthium densely pubescent, the calyx densely to moderately pubescent without, subglabrous to puberulent within, the petals glabrous or with ciliate margins, the disk pubescent, the style glabrous; *peduncles* uniflorous to triflorous, 1–9 mm long, ca. 0.6 mm wide, sometimes borne on short bracteate shoots, the branches of dichasia ca. 3 mm long; *bracteoles* linear to narrowly lanceolate, ca. 1–1.5 mm long, caducous before anthesis. CALYX closed except for an apical pore, with hairs sometimes protruding from pore, tearing irregularly at anthesis; *petals* obovate to suborbicular, ca. 7 mm long; *disk* ca. 3.5 mm across at anthesis (5 mm in fruit); *stamens* ca. 6 mm long,

150 – 190, the anthers ca. 0.3 mm long, with a terminal gland and usually 2 other glands in the connective; *style* ca. 8 mm long, glabrous; *ovary* 3-locular; *ovules* 7–20 per locule, uniseriate on each lamella of a slightly peltate placenta. FRUIT 1–2 cm in diam.; *seeds* few, ca. 6 mm long. (Fig. 11).

Representative specimens examined. Anguera, Fazenda Retiro, ca. 18 km de Feira de Santana na Estrada do Feijão sentido Ipira, 12.161667°S, 39.183889°W, 300–600 m, 22 May 2007 (st), *Cardoso and Santos 1968* (ASU0057573); **Cachoeira**, Estação de mata, Vale dos Rios Paraguaçu e Jacuípe, (B. Bananeiras), 12.5333°S, 39.0833°W, 40–120 m, Oct 1980, *Pedra do Cavalo et al. 814* (CEPEC); **Feira de Santana**, 151 km NW de Jaguara, Fazenda Monte Verde, 12.0763°S, 39.1842°W, 320 m, 21 Jul 1987 (fl), *Quieroz et al. 1742* (ASU0019703).

Phenology—Flowering in June, July, October, and December and probably fruiting shortly afterward.

Habitat and Distribution—Reported to grow in "floresta estacional" (seasonally deciduous forest). Found at elevations from 40 to 320 m. Endemic to Bahia.

Distinguishing Features—The only cauliflorous species of *Psidium*; also distinguished by clusters of small flowers (flower buds 4–6 mm long), a closed calyx and a densely pubescent hypanthium. Only five collections of *Psidium cauliflorum* are known to me, so little is known of this very distinctive, but rare species.

A second cauliflorous species, *Psidium grazielae* Tuler and M. C. Souza, has recently been discovered from Rio de Janeiro and Espirito Santo (Tuler et al. 2017). It may eventually be found in Bahia. It differs from *P. cauliforum* in having longer inflorescences and glabrous flower buds.

8. *Psidium firmum* O. Berg, in Mart., Fl. bras. 14(1): 390. 1857. TYPE. Brazil. "ad Barreiros in prov. Goyazensi." *Pohl 3195* (HOLOTYPE: W-16675).

Myrtus grandifolia O. Berg, in Martius, Fl. bras. 14(1): 419. 1857. TYPE. Brazil. "ad Rio Jequitinhonha prov. Minarum." *Pohl 5752* (HOLOTYPE: W-16682!)

Psidium firmum var. ***subcordatum*** O. Berg, in Martius, Fl. bras. 14(1): 601. 1859. TYPE. Brazil. "prope Paracatu prov. S. Pauli." *Riedel s.n.* (SYNTYPES: LE-6976, LE-6977).

Guajava firma (O. Berg) Kuntze, Rev. Gen. 239. 1891.

Psidium minense Mattos, Loefgrenia 42: [2]. 1970. New name for *Myrtus grandifolia* O. Berg.

Psidium lourteigii Legrand, Bradea 1(17): 157. 1972. TYPE. Brazil. "Goiás, Munic. Niquelandia. " *Macedo 3663* (HOLOTYPE: MVM. ISOTYPE: S-r-9453).

Psidium macedoi Kausel, Lilloa 33: 108. 1972. TYPE. Brazil. "Goiás, Niquelandia." *Macedo 3663* (HOLOTYPE: S-r-9453).

Shrub to ca. 1 m high, appearing glabrous but sometimes minutely puberulent on young growth, glabrescent with age; *hairs* less than 0.1 mm long, whitish; *young twigs* gray-green, minutely puberulent to glabrous, the older twigs with scaly or flaky reddish brown to gray bark. LEAVES elliptic, elliptic-oblong, ovate-oblong, ovate, or suborbicular, 3.7–13 cm long, 3–8 cm wide, 1.2–2.3 times as long as wide; *apex* acute, acuminate, or cuspidate; *base* rounded, obtuse, or cordate; *petiole* 2–5 mm long, 2–4 mm thick, channeled or flat; *venation* brochidodromous, the midvein nearly flat, somewhat impressed or raised above, prominent below, the lateral veins prominent, straight to slightly curved, flat or raised above, raised below, (4–)7–12 pairs, leaving the midvein at an angle of 45–60°, the marginal vein about equaling the laterals in prominence, arching slightly between laterals but paralleling the margin 1–3 mm from

it, the tertiary veins reticulate, appearing to arise from the marginal vein; *blades* nearly concolorous, drying yellow-green, gray-green, or reddish brown, thickly coriaceous. FLOWER BUD pyriform, 8–10 mm long, the hypanthium campanulate, 3–5 mm long, the distal portion of bud subglobose (sometimes wider than long), 4–5 mm long; *indumentum pattern of buds* with all surfaces glabrous, or bracteoles, calyx lobes, and petals ciliate, or some surfaces minutely puberulent, especially densely so on calyx within; *peduncles* 0.6–2.2 cm long, 1–2.5 mm wide,usually solitary in the axils of leaves, less often subtended by bracteole-like bracts, occasionally borne on leafless shoots; *bracteoles* narrowly triangular to lanceolate-triangular, clasping the hypanthium, 2–3.2 mm long, 0.6–1.2 mm wide, persisting after anthesis or not. CALYX open in bud, bowl-like, tearing ca. 1 mm between the lobes at anthesis, the tears not cutting the staminal ring, the lobes about triangular, 2–7 mm long, 4–5 mm wide; *petals* obovate, 7–10 mm long; *disk* 6–7 mm across, minutely puberulent; *stamens* 150–310, 5–10 mm long; *anthers* ca. 1 mm long, with 1 terminal gland; *style* 5–7 mm long, glabrous; *ovary* 3–5-locular, the inner surfaces puberulent, the ovules 35–75 per locule, the placenta protruding as 2 lamellae, with 2–3 rows of ovules on each lamella. FRUIT globose, up to ca. 2.5 cm in diameter; *seeds* probably up to ca. 50, reniform, rounded, ca. 3 mm in length. (Fig. 12).

Representative specimens examined. Feira de Santana, 12.567°S, 41.383°W, 5 Jan 1998 (fl), *Funch 1093* (HUEFS); **Ibiquara**, Capão da Volta, 13.4°S, 41.3°W, 19 Jul 1984 (fr), *Hatschbach 48356* (MBM); **Lençois**, Mata das Toalhas, 12.506944°S, 41.373056°W, 450 m, 6 Oct 1999 (fl), *Funch 1115* (HUEFS); **Mucugê**, estrada Mucugê-Guiné, a 7 km de Mucugê, 7 Sep 1981 (fl), *Pirani et al. CFCR 2009* (MBM, SPF); **Rio de Contas**, 9 km ao N da cidade na estr. para o pov. de Mato Grosso, 13.5°S, 41.83°W, 26 Oct 1988 (fr), *Harley et al. 25668* (CEPEC, F, SPF); **Seabra**, Serra da Agua de Rega, 22 km N of Seabra, road to Agua de Rega, 1000 m, 26 Feb 1971 (fl), *Irwin et al. 31114* (UB).

Phenology—Flowering mainly from July to October; fruiting from July to January, but mainly in October.

Habitat and Distribution—Found in Cerrado, campo, semideciduous forest in rocky and sandy soils. Found at elevations of 450–1850 m. Endemic to Brazil from São Paulo, Minas Gerais, Goiás (including Distrito Federal), and Bahia.

Distinguishing Features—Shrub to ca. 1 m high, appearing glabrous but sometimes minutely puberulent on young growth, glabrescent with age; leaves usually ovate to elliptic 3.7–13 cm long; calyx open in bud, bowl-like, tearing ca. 1 mm between the lobes at anthesis, the tears not cutting the staminal ring, the lobes about triangular, 2–7 mm long, 4–5 mm wide.

Psidium firmum and *P. salutare* var. *pohlianum* grow in similar habitats and can look rather similar. They are compared directly in couplet 27 of the key.

9. ***Psidium ganevii*** Landrum and Funch, Novon 18(1): 75. 2008. TYPE: Brazil. Bahia: Mun. de Abaíra: Engenho de Baixo-Catolés, próximo ao Rio do Ribeirão, 13°18'S, 41° 49'W, 950 m, carrasco com solo arenoso, 20 Nov. 1992 (fl), *Wilson Ganev 1518* (HOLOTYPE: HUEFS!. ISOTYPE: SPF-86814) and *Irwin, Harley and Smith 30790* (PARATYPE: NY-1104781!).

Shrub to ca. 3 m high, minutely puberulent on young twigs, leaf bases, and some floral surfaces, otherwise glabrous; *hairs* whitish to reddish brown, to ca. 0.1 mm long, erect; *young twigs* moderately puberulent, the hairs persisting until juvenile bark falls,

the young bark reddish brown to gray, falling in strip-like scales, the older twigs gray, somewhat rough with longitudinal ridges and cracks. LEAVES obovate, oblanceolate, or elliptic, 1.5–4(–5.3) cm long, 0.8–3 cm wide, 1.1–2.5 times as long as wide, the margins revolute; *apex* rounded to obtuse, often emarginate; *base* acute, cuneate, acuminate, or rounded; *petiole* channeled, puberulent, 1–3 mm long, 1–1.5 mm thick; *venation* brochidodromous, the midvein flat to slightly impressed above, moderately prominent below, the lateral veins usually obscure, to ca. 9 pairs, scarcely visible, leaving midvein at ca. 45°, the marginal vein indistinct, apparently closely following the margin; *blades* coriaceous, densely glandular, with raised glands on both surfaces, drying reddish brown to yellowish tan, lighter below, the upper surface often tinged with gray, often somewhat lustrous. FLOWER BUDS pyriform to campanulate, 7–9 mm long, the hypanthium obconic to funnel-form, 4–5 mm long, the distal portion of bud truncate to compressed orbicular, 3–4 mm long; *indumentum pattern of buds* with all surfaces glabrous or with only scattered minute hairs, or the disk and calyx within densely appressed puberulent; *peduncles* 10–22 mm long, 1–1.2 mm wide, somewhat flattened, glabrous to sparsely puberulent, borne in the axils of leaves or bracts; bracteoles linear, 1.5–2 mm long, sparsely puberulent. CALYX bowl-like, fused beyond ovary summit for 3–4 mm, open distally as a large apical pore, the pore margin merely sinuate, without notable lobes, the tubular portion of the calyx tearing irregularly 3–4 mm to staminal ring at anthesis in 4–5 lobes; mature *petals* unknown; *disk* ca. 5 mm across after anthesis; *stamens* over 100, 8–10 mm long; *anthers* 0.5–0.7 mm long, with 1 terminal gland in the connective; *style* 8–10 mm, glabrous, the stigma ca. 0.3 mm wide or less ; *ovary* 3-locular; *ovules* 12 –14 per locule, the placenta subpeltate. FRUIT glabrous, globose, 1.5–2.5 cm long; seeds probably fewer than 10, ca. 7 mm long. (Fig. 13).

Representative specimens examined. Abaíra, Catolés, encosta da Serra da Tromba, 13.2861°S, 41.8°W, 830 m, 7 Feb 1999 (fr), *Miranda et al. 447* (ASU0007300); **Campo Formoso**: Serra dos Morgados, 10.2428°S, 40.2658°w, 819m, 14 Apr 2006 (fl), *Santos 561* (ASU0014351); **Seabra**, Chapada Diamantina, BR-142, 4 km de Seabra (estrada Seabra-Barreira), 12.4167°S, 41.8°w, 935 m, 6 Aug 1996 (fr), *Araujo 1266* (ASU0074798-photos); **Morro do Chapéu**, 11 km W de Morro do Chapéu, 11.5208°S, 41.2586°w, 1085 m, 2 May 1999 (fr), *França et al. 2834* (ASU0007301).

Phenology—Collected in flower in November, probably continuing to January based on specimen with young fruits; collected in fruit in February, April, May, and August.

Habitat and Distribution—*Psidium ganevii* is found in caatinga and savanna vegetation, in sandy soils, at elevations of 800–1200 m. Endemic to central Bahia.

Distinguishing Features—Glabrous except for by being minutely puberulent on young twigs, leaf bases, and some floral surfaces; leaves rarely over 4 cm long, densely glandular on both surfaces and commonly with emarginate apices; calyx bowl-like with a large apical pore, densely puberulent within.

Psidium ganevii was compared with *P. cattleyanum* when described (Landrum and Funch 2008). It is also similar to *P. brownianum*. I have found one specimen that I believe to be a hybrid between these species (*Ganev 3255* at HUEFS). The key below distinguishes these two taxa.

1. Flower bud 7–8 mm long, the calyx bowl-like with a large terminal pore, tearing regularly in 4–5 lobes; leaves obovate, oblanceolate, or elliptic, 1.5–4(–5.3) cm long, the blade coriaceous, the venation obscure; petiole 1–3 mm long; base never cordate; apex rounded, often emarginated; peduncle 10–22 mm long; fruit 1.5–2.5 cm long; seed 7–10 mm long. ..... ***P. ganevii***

1' Flower bud 4–13 mm long, the calyx usually closed and apiculate, less often with a terminal pore, falling as a calyptra or tearing irregularly, or regularly in 4 or 5 lobes; leaves ovate, lanceolate, lanceolate-oblong (rarely elliptic), the blade subcoriaceous, the venation usually prominent, the veins often impressed or raised above; petiole 0–4(–5) mm long; base often cordate; apex usually acute; peduncle 2–30 mm long; fruit 0.5–1(–1.7) cm long; seed 3–4 mm long. ..... ***P. brownianum***

10. *Psidium glaziovianum* Kiaerskou, Enum. Myrt. bras. 33, tab. 3, fig. a-c. 1893. TYPE. Brazil. *Glaziou 13861* (SYNTYPE: C-10015955 [with illustration]. ISOSYNTYPES: P-258461!, K-170077) and *Glaziou 13870* (SYNTYPE: C-10015954. ISOSYNTYPES: BR-526986, F-65696!, G-227698!, P-258459!, P-258460!).

Tree ca. 5 m high, moderately to sparsely puberulent on young growth and leaves; *hairs* whitish or yellowish, up to ca. 0.5 mm long, antrorse, somewhat appressed; *young twigs* moderately puberulent, light brown to greenish, becoming gray with age, remaining smooth, the bark of older twigs becoming scaly. LEAVES elliptic to lanceolate, 3.8–7 cm long, 1.2–2.4 cm wide, 2.5–3.2 times as long as wide, very sparsely pubescent, or moderately so along midvein above, with 20–30 glands per mm , with subacicular, stipule-like colleters often present at the base of the petiole, the margin sinuate; *apex* acute, acuminate, or less often rounded; *base* cuneate to acuminate; *petiole* 1–2 mm long, 0.7–1 mm wide, more or less flat, puberulent, sometimes scarcely distinguishable from blade; *venation* brochidodromous, the midvein about flat above, moderately prominent below, the lateral veins weak, 5–9 pairs, scarcely visible, leaving midvein at ca. 45°, the marginal vein broadly arching between the laterals, faint; *blades* membranous to submembranous, drying gray-green to dark reddish brown, sometimes whitish below (apparently with wax), the margin sinuate. FLOWER BUDS pyriform, 4–5 mm long, glabrous to puberulent, the hypanthium campanulate, 2–2.5 mm long, the distal portion of bud subglobose to ovoid, 2–3 mm long; *indumentum pattern of buds* with outer surfaces and calyx apically within thinly puberulent (perhaps sometimes glabrous), with calyx proximally within, style and disk glabrous; *peduncles* uniflorous, 6–15 mm long, ca. 0.3 mm wide, borne in axils of leaves or at leafless nodes (possibly where bracts have fallen), remaining puberulent; *bracteoles* linear to filiform, 1–3 mm long, mostly caducous at anthesis. CALYX nearly closed in bud, with 4 or 5 wart-like apical lobes, at anthesis tearing into 2–4 irregular lobes 2–3 mm long, these mostly persisting until fruit matures; *petals* obovate to suborbicular, ca. 2 mm long; *disk* in fruit ca. 1.5 mm across, glabrous; *stamens* 120–147; *anthers* ca. 0.3 mm long, with a single terminal gland; *style* ca. 3 mm long; *ovary* 2–3-locular; *ovules* 18–23. FRUIT globose, ca. 6 mm long (excluding calyx), glabrescent; *seeds* 7–8 per fruit, ca. 2.5–3 mm long. (Fig. 14).

Representative specimens examined. Jequié, ca. 11–17 km a W de Jequié, estrada a Lafayete Coutinho, 19 Nov 1978 (fl), *Mori et al. 11212* (CEPEC, NY); **Jequié**, estrada Jequié–Contendas do Sincorá, a 6 km de Jequié, 13.857°S, 40.083°W, *de Carvalho 136* (CEPEC); **Manoel Vitorino**, Rod. M. Vitorino/Caatingal, km 8, 14.2°S, 40.2°W, 16 Feb 1979 (fr), *Mattos Silva et al. 281* (ASU0075447, CEPEC, NY).

Phenology—Flowering in November; fruiting in January and February.

Habitat and Distribution—Caatinga; growing at about 840 m in Minas Gerais; known only from Minas Gerais and Bahia.

Distinguishing Features—Calyx closed or nearly closed in bud, with (4–)5 wart-like abaxial protrusions to ca. 0.5 mm long; leaves membranous to submembranous at anthesis; petals ca. 2 mm long; fruit ca. 6 mm long.

11. ***Psidium grandifolium*** DC., Prodr. 3: 234. 1828. TYPE. BRAZIL. "ad Ypanema prov. S. Pauli," *Martius s.n.* (HOLOTYPE: M-32375).

Psidium cinereum DC., Prodr. 3: 234. 1828. TYPE. BRAZIL. "prov. Sancti Pauli," *Martius s.n.* (HOLOTYPE: M-146757).

Psidium incanescens DC., Prodr. 3: 234. 1828. TYPE. BRAZIL. "prope Taubate prov. S. Pauli," *Martius s.n.* (HOLOTYPE: M-32378. ISOTYPE: BR-528845!).

Psidium ternatifolium Cambess., in A. St.-Hil., Fl. Bras. Merid. 2: 278. 1833. TYPE. BRAZIL. "Fazenda das Lages in provincia S. Pauli," *Saint-Hilaire s.n.* (HOLOTYPE: P-258455!).

Psidium grandifolium *var.* ***genuinum*** O. Berg, in Mart., Fl. bras. 14(1): 406. 1857. Name to be replaced by the autonym *P. grandifolium* var. *grandifolium* because Berg cites *P. grandifolium* under this variety.

Psidium grandifolium var. ***intermedium*** O. Berg, in Mart., Fl. bras. 14(1): 407. 1857. TYPE. BRAZIL. "prov. Rio Grande do Sul," *Sellow s.n.* (HOLOTYPE: B, lost. ISOTYPE: P-258453!, previously designated as LECTOTYPE by Landrum [2005]. ISOLECTOTYPE: P-258454!).

Psidium grandifolium var. ***ternatifolium*** (Cambess.) O. Berg, in Mart., Fl. bras. 14(1): 407. 1857.

Psidium grandifolium var. ***heterophyllum*** O. Berg, in Mart., Fl. bras. 14(1): 407. 1857. TYPE. BRAZIL. "prov. Minarum," *Claussen 1527* (HOLOTYPE: W-16677. ISOTYPE: LE-6980).

Psidium grandifolium var. ***tenuinerve*** O. Berg, in Mart., Fl. bras. 14(1): 407. 1857. TYPE. BRAZIL. "prov. Minarum prope urbem S. João," *Pohl 3630* (HOLOTYPE: W-16681).

Psidium cinereum var. ***angustifolium*** O. Berg, in Mart., Fl. bras. 14(1): 404. 1857. Name to be replaced by the autonym *P. cinereum var. cinereum* because Berg cites *P. cinereum* under this variety.

Psidium cinereum var. ***brevipes*** O. Berg, in Mart., Fl. bras. 14(1): 404. 1857. TYPE. BRAZIL. "in prov. Minarum," *Claussen 527* (HOLOTYPE: BR-843772. ISOTYPES: G [=F-neg. 23492], K-565481).

Psidium cinereum var. ***intermedium*** O. Berg, in Mart., Fl. bras. 14(1): 404. 1857. TYPE. Brazil. "prope urbem Barbacena prov. Minarum," *St. Hilaire s.n.* (SYNTYPE: B, lost) and "ad Urbem Ypanema prov. S. Pauli," *Sellow s.n.*, (SYNTYPE: B, lost. LECTOTYPE designated by Landrum [2005]: P-258482!; remaining SYNTYPES, P-258480! in part, sheet mixed, K-565480 in part, mixed sheet).

Psidium incanescens var. ***parvifolium*** O. Berg, in Mart., Fl. bras. 14(1): 403. 1857. TYPE. Brazil. "v. in. herb. Sond. et Mart." "prov. Minarum prope urbem S. João del Rey," *St. Hilaire s.n.* (no specimens found) and *Widgren 529* (ISOSYNTYPES: LE-6982, R-162761!) and "Chapeo d'Uvas," *White 4163* (SYNTYPE: BR-843775).

Psidium incanescens var. ***rotundifolium*** O. Berg, in Mart., Fl. bras. 14(1): 403. 1857. TYPE. BRAZIL. "prov. Rio Grande do Sul," *Sellow s.n.* (SYNTYPE: B, lost) and "S. Rita et S. João Baptista," *Pohl 500* (SYNTYPE: B, lost. ISOSYNTYPE: W-46100!, previously designated as LECTOTYPE [Landrum, 2005]) and "ad Paracatu," *Pohl 729* (SYNTYPE: B, lost. ISOSYNTYPE: W-48297!).

Psidium incanescens var. ***cuneatum*** O. Berg, in Mart., Fl. bras. 14(1): 403. 1857. Name to be replaced by the autonym *P. incanesens* var. *incanescens* because Berg cites *P. incanescens* under this variety.

Psidium cuneatum var. ***incanescens*** O. Berg, in Mart., Fl. bras. 14(1): 405. 1857. TYPE. BRAZIL. "in eadem prov." [i.e., Minas Gerais] *Regnell I-129* (HOLOTYPE: MEL-2101229. ISOTYPE: U-5181).

Psidium grandifolium var. ***albidum*** O. Berg, in Mart., Fl. bras. 14(1): 603. 1859. TYPE. BRAZIL. "Prope Pindamonhangaba et Taubate," *Riedel* [*1379*]. (HOLOTYPE: LE-6979).

Psidium grandifolium var. ***incanescens*** O. Berg, in Mart., Fl. bras. 14(1): 603. 1859. TYPE. BRAZIL. "Prope Pindamonhangaba et Taubate," *Riedel* [*1379*]. (HOLOTYPE: LE-6981).

Psidium riedelianum O. Berg, in Mart., Fl. bras. 14(1): 603. 1859. TYPE. BRAZIL. "prope villam Jaguara prov. Minarum," *Riedel s.n.* (apparent holotype, LE-7001).

Guajava incanescens (DC.) Kuntze, Rev. Gen. Pl. 1: 239. 1891.

Guajava grandifolia (DC.) Kuntze, Rev. Gen. Pl. 1: 239. 1891.
Guajava cinerea (DC.) Kuntze, Rev. Gen. Pl. 1: 239. 1891.
Guajava riedeliana (O. Berg) Kuntze, Rev. Gen. Pl. 1: 239. 1891.
Psidium eriophyllum Barb. Rodr., Myrt. Paraguay 12. 1903. TYPE. PARAGUAY. "vicine Rio Igatemy, prope Yerbales Serra Maracayu," *Hassler 5659* (HOLOTYPE: G-194090 [2 sheets]).
Psidium lanatum Barb. Rodr., Myrt. Paraguay 13. 1903. TYPE. PARAGUAY. "Ipe hu.....Serra Maracayu," *Hassler 5263* (HOLOTYPE: G-194092).
Psidium spodophyllum Barb. Rodr., Myrt. Paraguay 14. 1903. TYPE. PARAGUAY. "prope Rio Corrientes," *Hassler 4521* (HOLOTYPE: G-194093).
Psidium apaense Barb. Rodr. ex Chodat and Hassl., Bull. Herb. Boissier 7: 798. 1907. TYPE. PARAGUAY. "in regione cursus superioris fluminis Apa," *Hassler 8529* (HOLOTYPE: G [= ASU photo]).
Psidium paraguayense Barb. Rodr. ex Chodat and Hassl., Bull. Herb. Boissier 7: 798. 1907. TYPE. PARAGUAY. "pr. Igatimi," *Hassler 4831* (HOLOTYPE: G [3 sheets, = ASU photos]. ISOTYPE: BM-511330).
Psidium psychrophyllum Barb. Rodr. ex Chodat and Hassl., Bull. Herb. Boissier 7: 797. 1907. TYPE. PARAGUAY. "in alta-planitie Loma guazu in valle fluminis Y-aca," *Hassler 6805* (HOLOTYPE: G [2 sheets, = ASU photos]).
Psidium yacaense Barb. Rodr. ex Chodat and Hassl., Bull. Herb. Boissier 7: 797. 1907. TYPE. PARAGUAY. "pr. Valenzuela," *Hassler 7099* (HOLOTYPE: G [= ASU photo]).
Psidium cinereum var. ***paraguariae*** D. Legrand, Fl. Illustr. Catarin., Mirtáceas 694. 1977. TYPE. PARAGUAY. *Rosengurtt 5407* (HOLOTYPE: MVM) and *Pedersen 4366* (PARATYPE: MVM? ISOPARATYPES: MO!, NY! [=ASU photo], SI-3060).
Psidium cinereum DC. var. ***incanescens*** (DC.) D. Legrand, Fl. Illustr. Catarin., Mirtáceas, 692. 1977.

Shrub to ca. 1.5 m high, densely white tomentose or pubescent on young growth; *hairs* white (sometimes with a reddish brown tinge), up to ca. 1.5 mm long; *young twigs* often square in cross section, especially in vigorous growth, densely white tomentose. LEAVES elliptic, obovate, oblanceolate, lanceolate, (rarely suborbicular), 3.6–12 cm long, 2–5.8 cm wide, 1.7–3 times as long as wide, densely white tomentose below, sparsely hairy to glabrescent above when mature, often with somewhat longer, persistent hairs along the midvein above; *apex* acute, rounded, acuminate, often with a cuspidate tip; *base* acute, obtuse, rounded, or cuneate; *petiole* 1–6 mm long, 1–2 mm thick, channeled or not; *venation* usually eucamptodromous proximally to brochidodromous distally, the midvein impressed to flat above, prominent below, the lateral veins usually 4–7, ascending, a clear marginal vein not present, the smaller tertiary veins obscure or forming an irregular reticulate pattern, sometimes impressed above; *blades* subcoriaceous to stiffly coriaceous, dull to lustrous above, drying dark reddish brown to gray-green. FLOWER BUDS pyriform, campanulate, or subobconic, densely white tomentose, 7–15 mm long, the hypanthium obconic, 2.5–7 mm long, the distal portion of bud subglobose, 4–9 mm long; *indumentum pattern of buds* with all external surfaces except petals tomentose to pubescent, the bracteoles glabrous to tomentose within, the petals glabrous to pubescent without, glabrous within, the calyx densely covered with hairs within at least distally, the disk subglabrous to pubescent, the style glabrous; *peduncles* 0.2–5 cm long, 1–2 mm thick; *bracteoles* linear to narrowly elliptic, 2–8 mm long. CALYX nearly closed except for a terminal pore, with small lobes around the margin of the pore that are wider than long, to bowl-like with clearly distinguishable deltoid lobes that are up to 3 mm long and wide, the fused tubular portion of the calyx 1–4 mm long, tearing between the lobes or irregularly at anthesis, the tears sometimes cutting the staminal ring; *petals* elliptic to obovate, 9–10

mm long; *disk* 5–9 mm across; stamens (80–)260–560, 4–11 mm long; *anthers* oblong, 0.8–1 mm long, with 1–3 glands in the connective; *style* 5–10 mm long; *ovary* 2–5-locular, or sometimes the locules not completely fused; *ovules* 25–80 per locule, ca. 6-seriate, the placenta axile but not peltate, hidden by an obconic mass of ovules, sometimes partially parietal when locules are not completely fused. FRUIT subglobose, 1–2.5 cm in diameter; *seeds* (2–)3–4(–6) mm long, smooth, rounded, 19–85 per fruit, frequently attacked by insects and larger than normal. (Fig. 15).

Representative specimens examined. Abaíra, Dist. Catolés, Serra do Porco Gordo-Gerais do Tijuco, 13.4°S, 41.75°W, 1250 m, 24 Apr 1992 (fr), *Ganev 179* (HUEFS); **Caetité**, 6 km S de Caetité camino a Brejinho das Ametistas, 14.03°S, 42.53°W, 20 Nov 1992 (fl), *Arbo 5627* (ASU0007390); **Ibiquara**, 25 km ao N de Barra da Estiva na estrada novo para Mucugê, 13.4167S, 41.3°W, 20 Nov 1988 (fl), *Harley 26964* (ASU0007317); **Licínio de Almeida**, 14.698694°S, 42.558556°W, 1020 m, 29 Oct 2012 (fr), *Stadnik 114* (ASU0075037-photo); **Mucugê**, 15 km de Riacho de Cima na estrada para Mucugê, 13.2425°S, 41.5267°W, 1140 m, 5 Feb 1999 (fr), *Miranda 55* (ASU0007326); **Piatã,** proximo a serra do Gentio, Gerais, entre Piatã e Serra da Tromba, 13.15°S, 41.8°W, 21 Dec 1984 (fl), *Stannard et al. 7418* (ASU0006714); **Rio de Contas,** Serra do Mato Grosso, 13.389444°S, 41.889722°W, 1340 m, 3 Feb 1997 (fr), *Harley 4993* (HUEFS).

Phenology—Flowering throughout year but mainly in October and November; fruiting throughout year but mainly from December to March.

Habitat and Distribution—From northeast Argentina, Paraguay, Bolivia, and Brazil (Santa Catarina to Bahia); campo and cerrado at 800 to 1200 m.

Distinguishing Features—Hypanthium and lower surface of at least young leaves densely covered with whitish hairs, the hypanthium surface at anthesis usually obscured by hairs; *venation* usually eucamptodromous proximally to brochidodromous distally, the lateral veins usually 4–7 pairs, ascending; Calyx open and bowl-like, to nearly closed.

Hybridization with *Psidium guineense* is probably common and confusion with that species is possible. Below is a key that distinguishes *P. grandifolium* from *P. guineense*.

1. Anthers elongate, 1–3 mm long, usually 3–6 times as long as wide; placenta laminar, sometimes peltate; tertiary veins often producing a ladder-like pattern; hairs of lower leaf surface usually more or less erect, mostly nearly straight, usually reddish brown.....***P. guineense***
1' Anthers not elongate, 0.5–1 mm long, about 2 times as long as wide; placenta mound-like, not laminar or peltate; tertiary veins reticulate; hairs of lower leaf surface generally appressed and straight to densely tangled, usually whitish.....***P. grandifolium***

Psidium grandifolium is also similar to, and seems to hybridize with, *P. australe*. See discussion under that species.

12. *Psidium guajava* L., Sp. Pl. 470. 1753. TYPE. "Habitat in India," cultivated plant from Hort. Cliff. (LECTOTYPE: BM-628598 [designated by McVaugh 1989]).

Psidium cujavus L., in Stickman, Herb. Amboin.: 7. 1754. Based on a manuscript of Rumphius? Specimen in LINN (LINN-hl635-6] apparently not *Psidium*.

Psidium pomiferum L., Sp. Pl. ed. 2. 672. 1762. A new superfluous name for *P. guajava*; lectotype of *P. guajava* is cited under this species.

Psidium pyriferum L., Sp. Pl. ed. 2. 672. 1762. TYPE. "in indiis," "Pluk. Alm. 181." (possible type material LINN-hl635-1, LINN-hl635-2).

Psidium cujavillus Burm. f., Fl. Ind. 114. 1768. TYPE. "Rumph. Amb. I. p. 145. T. 49." "Habitat in India." (HOLOTYPE. Illustration [T. 49] of Rumphius in Herbarium Amboinense).

Psidium angustifolium Lamarck, Encyc. 3: 17. 1789. Lamarck cites same description and illustration of Rumphius that Burmann used ("Rumph. Amb. I. p. 145. T. 49."), so this is a superfluous name.

Psidium sapidissimum L., Jacq. Pl. Hort. Schoenbr. 3: p. 62. t. 366. 1798. TYPE. Illustration of Jacquin.

Psidium pumilum Vahl, Symb. Bot. 2. 56. 1791. A new superfluous name for *P. cujavillas* Burm.f.

Psidium pumilum var. ***rufescens*** Blume, Mus. Bot. Lugd. Bat. 1: 71. 1821. TYPE. "In maritimus Archipelagi Indici et Moluccarum." (No specimen found).

Psidium pumilum var. ***intermedium*** Blume, Mus. Bot. Lugd. Bat. 1: 72. 1821. TYPE. "In maritimus Javae, Amboinae etc." (No specimen found).

Psidium pumilum var. ***guadalupense*** DC., Prodromus 3: 233. 1828. TYPE. "in Guadalupa. *Bertero.*" (No specimen found.)

Psidium pomiferum var. ***sapidissimum*** (Jacq.) DC., Prodromus 3: 234. 1828.

Psidium aromaticum Blanco, Fl. Filip. ed. I. 417. 1837. Philippines. Description and vernacular names indicate that this is *P. guajava*. This is a later homonym of *P. aromaticum* Aublet (=*Campomanesia aromatica* (Aublet) Griseb.

Psidium pyriferum var. ***glabrum*** Bentham, in Hook. J. bot. 2: 318. 1840. Nomen nudum.

Psidium fragrans Macfad., Fl. Jamaica 2: 108. 1850. TYPE. Jamaica. "Salt Hill, Port Royal Mountains." *Macfadyen s.n.* (no specimen found.)

Guajava pumilia (O. Berg) Kuntze, Rev. Gen. 240. 1891.

Guajava pyrifera (L.) Kuntze, Rev. Gen. 239. 1891.

Psidium guajava var. ***cujavillum*** (Burm.f.) Krug and Urb. Bot. Jahrb. Syst. 19: 566. 1894.

Syzygium ellipticum K. Schum. and Lauterb., Fl. Schutzgeb. Sudsee: 476. 1900. TYPE. Papua New Guinea. "Bei Finschhafen, in der Nähe von Ibekippo bei Bonga," "fruchtend am 26. August 1890." *Lauterbach 785* (HOLOTYPE: BM?).

Psidium igatemyense Barb. Rodr., Myrt. Paraguay 10. 1903. TYPE. Paraguay. "vicine Rio Igatemy." *Hassler 4753* (HOLOTYPE: G-194284).

Psidium chodatianum Barb. Rodr. ex Chodat and Hassl., Bull. Herb. Boissier 7: 797. 1907. TYPE. Paraguay. "pr. Igatimi." *Hassler 4792* (HOLOTYPE: G [2 sheets, =ASU photos]).

Psidium crispum Barb. Rodr. ex Chodat and Hassl., Bull. Herb. Boissier 7: 798. 1907. TYPE. Paraguay. "Cordillera de Altos" *Hassler 1442* (HOLOTYPE: G [2 sheets, =ASU photos]).

Psidium ellipticum Barb. Rodr. ex Chodat and Hassl., Bull. Herb. Boissier 7: 799. 1907. TYPE. Paraguay. "pr. Igatimi" *Hassler 4745* (HOLOTYPE: G [3 sheets, =ASU photos]. ISOTYPES: MICH-1210413!, MPU-10984, NY-1288045!, NY-1288046!, S-r-9450, UC!, W-3585!).

Psidium subcrenatum Barb. Rodr. ex Chodat and Hassl., Bull. Herb. Boissier 7: 799. 1907. TYPE. Paraguay. "pr. Bellavista, Apa." *Hassler 7793* (HOLOTYPE: G, =ASU photo).

Psidium globosum Larrañaga, Escritos D. A. Larrañaga 2: 168. 1923. TYPE. Uruguay. (HOLOTYPE: presumably Larrañaga collection, "Abril 30 de 1814." "proprios para jardines."

Psidium guajava forma ***cujavillum*** (Burm. f.) Deg. and Deg., New Illustr. Fl. Hawaiian Islands [Fam. 273]. 1959.

Psidium guajava var. ***minor*** Mattos, Loefgrenia 70: 5. 1976. TYPE. Brazil. São Paulo, Instituto Agronomico de Campinas. *Mattos 16234.* Photos at ASU of apparent type plant sent by M. Lacerda.

Possible hybrids with *Psidium guineense*.

Psidium chrysobalanoides Standley, Publ. Field Columbian Mus., Bot. Ser. 8: 319. 1931. TYPE. Belize. "All Pines." *Schipp 596* (HOLOTYPE. F-65681. ISOTYPES: A-71231, BM-543071, GH-71236, K-565316, MICH-1210414!, NY-1288039!, S-r-9447, UC-426873).

Psidium hypoglaucum Standley, Publ. Field Mus., Bot. 8: 320. 1931. TYPE. Belize. "All Pines." *Schipp S99* (HOLOTYPE: F-76373!).

Shrub or tree up to ca. 12 m high, subglabrous to densely appressed pubescent on young growth and lower leaf surfaces, the trunk smooth, light brown to light gray-green, with large flaky scales; *hairs* whitish, yellowish, or silvery, up to ca. 0.7 mm long, erect or appressed; *young twigs* quadrangular, slightly to strongly winged, often

sulcate (at least when dry), densely to moderately appressed-pubescent, the older twigs at first scaly with longitudinal striations or fibers, eventually smooth with irregular scales falling as patches. LEAVES elliptic, oblong, elliptic-oblanceolate, elliptic-obovate, or lanceolate, 4.5–14 cm long, 2.4–7.5 cm wide, 1.6–4 times as long as wide, densely to sparsely appressed pubescent below, subglabrous except for puberulent midvein above; *apex* acute, acuminate, to rounded; *base* rounded to slightly cordate; *petiole* 2–5 mm long, 1–2 mm thick, channeled, densely pubescent to subglabrous; *venation* brochidodromous distally to eucamptodromous proximally, the midvein impressed above, prominent below, the lateral veins 9–22 prominent pairs, ascending at angle of ca. 45°, nearly straight, curving toward apex near the margin and connecting with the next lateral, the marginal vein not clearly present or arching between the laterals, the tertiary veins connecting the laterals in a ladder-like to reticulate pattern; *blades* coriaceous to submembranous, drying yellow-green, gray-green, to dark reddish brown. FLOWER BUDS subfusiform to pyriform, 9–14 mm long, sometimes strongly constricted near the midpoint, the hypanthium narrowly campanulate, barrel shaped or fusiform 4–6 mm long, the distal portion of bud more or less ovoid, sometimes strongly so with a conical apex, 4.5–9.5 mm long; *indumentum pattern of buds* with peduncles, hypanthium, and bracteoles sparsely to moderately appressed pubescent, the calyx without glabrous to sparsely pubescent (usually less densely covered than that hypanthium), the calyx within glabrous or densely pubescent, the petals, disk, and style glabrous; *peduncles* 1–3-flowered, 1–3.5 cm long, 1–1.5 mm thick, terete; *bracteoles* linear to narrowly triangular, 2–5 mm long. CALYX closed, tearing irregularly as the bud opens, persisting or falling in ca. 3 parts; *petals* obovate to elliptic, 13–22 mm long; *disk* 4–6 mm across; *stamens* 280–720, 7–15 mm long; *anthers* 0.7–1 mm long, with 1–7(–10) glands; *style* 10–15 mm long; *ovary* 3–6-locular; *ovules* 90–180 per locule, multiseriate. FRUIT globose to pyriform, 2–6(–8) cm long, green to yellow without, with pink, yellow, or white flesh, aromatic; *seeds* numerous, subreniform, 3–4 mm long, more or less smooth, the seed coat ca. 0.25 mm thick. $2n = 22, 44$. (Fig. 16).

Representative specimens examined. Candeias, proximo a Candeias, 12.620278°S, 38.4067°W, 5 Feb 1980 (fr), *Araujo 179* (HRB); **Ilhéus**, área do CEPEC km 22 da Rod. Ilhéus/Itabuna BR 415, 14.81667°S, 39.033°W, 5 May 1980 (fr), *Hage and Brito 638* (CEPEC); **Salvador**, Parque Municipal da Pituba, 28 Dec 1974 (fr), *Costa s.n.* (ALCB).

Phenology—Flowering mainly in October and November; fruiting throughout year but mainly from January to September.

Habitat and Distribution—Disturbed areas such as roadsides, pastures, and also frequently cultivated, from near sea level to 1000 m. Widely distributed as a cultivated and escaped-weedy species in tropical and subtropical regions around the world.

Common names—Goiaba (Portuguese); guayaba (Spanish); guava (English); gobaya (French Guiana).

Distinguishing Features—Calyx closed in flower bud or open only as a terminal pore, tearing irregularly as the bud opens, usually in 2 or 3 parts; lateral veins usually more than 10 pairs; hairs on lower leaf surface appressed, whitish or silvery.

Psidium guajava is frequently confused with similar *P. guineense*; they have been hypothesized to hybridize (Landrum et al. 1995). They are contrasted in the key below.

1. Lateral veins usually 9–22 pairs; young twigs quadrangular, more or less winged; indumentum of lower leaf surface appressed, whitish, yellowish, or silvery; calyx usually tearing into 2 or 3 parts; anthers 0.7–1 mm long, usually with less than 10 glands. ..... ***P. guajava***

1' Lateral veins 5–10 pairs; young twigs more or less terete or compressed (some vigorous shoots sometimes 4–winged); more or less erect, reddish brown, less often appressed, whitish or grayish; calyx usually tearing into 5 parts; anthers 1–3 mm long, often with more than 10 glands..... ..... ***P. guineense***

The origin of cultivated *Psidium guajava* is unknown, but various interesting clues exist. The original habitat may have been riparian areas with periodic drought, because roadsides with occasional abundant water, and disturbed areas, such as pastures, are where the species thives presently.

Psidium guajava has been found in the archeological site Caral along a river valley of arid coastal Peru and may have been cultivated there as early as 4000 years ago along with plants such as squash (*Cucurbita* sp.), beans (*Phaseolus vulgaris* L.), camote (*Ipomoea batatas* [L.] Lam.), and cotton (*Gossypium barbadense* L.), but not Corn (*Zea mays* L.) (Shady Solis et al. 2001). In Central America and Mexico the earliest archeological find of *P. guajava* is about 2000 years old in the Tehuacán Valley of Mexico (Smith 1965). The earliest records of peanut (*Arachis hypogaea* L.; another South American cultivated plant) in Mexico are also from the Tehuacan Valley and of the same approximate age (Smith 1965).

By the time of European contact *Psidium guajava* was widely cultivated in the Caribbean region and various cultivars had been selected according to Fernandez de Oviedo y Valdez (1851, vol. 1, p. 304) who wrote his account in the early 1500s.

In summary *Psidium guajava* may have been first cultivated in coastal Peru as much as 4000 years ago, been transported to Mexico by at least 2000 years ago and been widely distributed in the Caribbean by the time of European contact.

It is interesting that "goiaba" is the common name frequently used for this species in Brazil, a variant of "guayaba" reported by Fernandez de Oviedo y Valdez (1851) and the name frequently used in Spanish speaking countries. Other species of *Psidium* in Brazil are usually called "araçá" (Legrand and Klein 1977), a name from Guarani. So it is possible that *P. guajava* is a relatively recent arrival in Brazil.

13. *Psidium guineense* Sw., Prodr. 77. 1788. TYPE. "Insula principis Africes, in Domingo culta." On type specimens: "Culta in Hispaniola," "ex Africa". Presumably *Swartz s.n.* (HOLOTYPE: S-r-5302. ISOTYPES: BM-616940, SBT-12641).

Psidium polycarpon Lambert, Trans. Linn. Soc. London 11: 231. 1813. TYPE. "indigenous to the grassy savannahs of Trinidad; from whence plants were sent to the St. Vicent's garden in 1792." (HOLOTYPE: BM. ISOTYPE: MICH-1210424!, W [=ASU photo]).

Psidium araca Raddi, Opusc. Sci. Bologna 4: 252. pl. 7, fig. 2. 1815. TYPE. Brazil. Rio-Janeiro. (HOLOTYPE: FI-5202).

Campomanesia tomentosa HBK, Nov. Gen. et Sp. 6:151. 1823. Colombia. "prope Ibague Novo-Granatensium." *Humboldt and Bonpland* s.n. (HOLOTYPE: P-679485. ISOTYPE: F! [=ASU photo]).

Psidium dichotomum Weinm. Syll. Ratisb. 2: 166. 1828. TYPE. "In Brasilia." (probable HOLOTYPE: LE [=ASU photo]).

Psidium hians DC., Prodr. 3: 234. 1828. Brazil. "ad Vaodo Parana in Tabuleiro et Catingas." *Martius* [*1791*] (SYNTYPES: M-32376 [annotated by de Candolle], M-32377 [with description by Martius

used by de Candolle], M-146873!). This was mistakenly considered a synonym of *Campomanesia pubescens* by Landrum (1986).

Psidium multiflorum Cambess. in Saint-Hilaire, Fl. Bras. merid. 2: 281. 1833. TYPE. Brazil. "In sylvis caeduis prope urbem S. Pauli." *Saint-Hilaire s.n.* (SYNTYPES: P-258410!, P-258411!, P-258412!). Cambessedes named a separate species (p. 287) *Psidium multiflorum*, based on a separate collection (P-1902177! the apparent holotype, and MPU-10990 an isotype), that is *Campomanesia pubescens* (DC.) O. Berg.

Psidium molle Bertol. Fl. Guatimal. 22, Tab. IX. 1840. TYPE. "Guatimala." TYPE. (HOLOTYPE: BOLO, seen as digital image; https://cotram.org/imglib/cotram/Myrtaceae/201707/Psidium_molle-holotype-BOLO_1499893527.jpg).

Psidium sericiflorum Bentham, Pl. hartw. 176. 1845. TYPE. Ecuador. "In campis circa Popayan." *Hartweg 980* (HOLOTYPE: K-565585 [labeled "possible isotype"]. ISOTYPES: BM-796855, F-65716!, LD-1514512).

Psidium schiedeanum O. Berg, Linnaea 27: 368. 1856. TYPE. Mexico. *Schiede 541* (HOLOTYPE: B, lost). Possible original material: LE-7006 (*Schiede 512*) annotated specimen by Berg as *P. schiedeanum*.

Psidium molle var. ***robustum*** O. Berg, Linnaea 27: 370. 1856. TYPE. [Guatemala]. "In monte Candelaria." *Oersted 21* (HOLOTYPE: C-10015956).

Psidium molle var. ***gracile*** O. Berg, Linnaea 27: 370. 1856. TYPE. Costa Rica. "Irasu." *Oersted 27* (HOLOTYPE: C-10015957).

Psidium laurifolium O. Berg, Linnaea 27: 364. 1856. TYPE. Costa Rica, "in monte Masaya." *Oersted s.n.* (HOLOTYPE: C-10015959).

Psidium costaricense O. Berg, Linnaea 27: 368. 1856. TYPE. Costa Rica. "ad Iar[z]u in Costa Rica." *Oersted 17* (HOLOTYPE: C-10015950).

Psidium benthamianum O. Berg, Linnaea 27: 362. 1856. Guyana. "Guiana Anglica." *Rob. Schomburgk 836* (SYNTYPE: B, lost. ISOSYNTYPES: BM-796849, G-227697!, K-170097, K-170098, MICH-1210415!, P-258486!, W-46097!) and *Rich. Schomburgk 314* (SYNTYPE: B, lost).

Psidium ooideum O. Berg, in Mart., Fl. bras. 14(1): 398. 1857. TYPE. Brazil. "prov. S. Pauli." *Sellow s.n.* (HOLOTYPE: B, lost. ISOTYPES: P-2428285, K-170093).

Psidium hians var. ***truncatum*** O. Berg, in Mart., Fl. bras. 14(1): 394. 1857. Name to be replaced by the autonym *P. hians* var. *hians* because Berg cites *P. hians* under this variety.

Psidium hians var. ***cuneatum*** O. Berg, in Mart., Fl. bras. 14(1): 394. 1857. TYPE. Brazil. Locality unclear. *Sellow s.n.* (HOLOTYPE: B, lost. ISOTYPE: K-170094). An additional specimen annotated by Berg but not cited is *Pohl 2154* [=W-48022!].

Psidium ypanemense O. Berg, in Mart., Fl. bras. 14(1): 395. 1857. TYPE. Brazil. "v. in hb. Mart. et Berol." "ad pagum Ypanema in prov. S. Pauli." *Raben 757* (SYNTYPE: BR-843781). *Sellow s.n.* (SYNTYPE: BR-843783. ISOSYNTYPES: K-565299, LE-7014, W-46099!).

Psidium ooideum var. ***parvifolium*** O. Berg, in Mart., Fl. bras. 14(1): 602. 1859. Name to be replaced by the autonym *P. ooideum* var. *ooideum* because Berg considers it to include the type of the species.

Psidium ooideum var. ***intermedium*** O. Berg, in Mart., Fl. bras. 14(1): 602. 1859. TYPE. Brazil. "prope Batataes." *Riedel* [*2293*]. (HOLOTYPE: LE-6994).

Psidium ooideum var. ***grandifolium*** O. Berg, in Mart., Fl. bras. 14(1): 602. 1859. TYPE. Brazil. "prope Batataes et Itu." *Riedel* [*2059*] (SYNTYPES: LE-6989, LE-6990, LE-6991, LE-6992, LE-6993. ISOSYNTYPES: G-227729!, P-258402!, P-258403!).

Guajava ypanemensis (O. Berg) Kuntze, Rev. Gen. 239. 1891.

Guajava polycarpa (Lambert) Kuntze, Rev. Gen. 239. 1891.

Guajava multiflora (Cambess.) Kuntze, Rev. Gen. 239. 1891.

Guajava hians (O. Berg) Kuntze, Rev. Gen. 239. 1891.

Guajava rubescens (O. Berg) Kuntze, Rev. Gen. 239. 1891.

Guajava guineensis (Sw.) Kuntze, Rev. Gen. 239. 1891.

Guajava ooidea (O. Berg) Kuntze, Rev. Gen. 239. 1891.

Guajava schiedeana (O. Berg) Kuntze, Rev. Gen. 240. 1891.

Guajava costaricensis (O. Berg) Kuntze, Rev. Gen. 240. 1891.

Guajava laurifolia (O. Berg) Kuntze, Rev. Gen. 240. 1891.

Guajava mollis (Bertol.) Kuntze, Rev. Gen. 240. 1891.

Guajava benthamiana (O. Berg) Kuntze, Rev. Gen. 240. 1891.

Psidium ooideum var. ***longipedunculatum*** Rusby, Mem. Torrey Bot. Club 3(3): 27.1893. TYPE. Bolivia. "Yungas." *Bang 287* (HOLOTYPE: NY-1288067!. ISOTYPES: BM-1125476, CORD-3582, E-504661, F-42755, M-146745!, MICH!, PH-22411, PUL-384, R-162777!, US-117670, W-1372!).

Psidium lehmannii Diels, Bot. Jahrb. Syst. 37: 594. 1906. TYPE. Colombia, "circ. Popayan 1000-1800 m." *Lehmann, F. C. 5820* (HOLOTYPE: B, lost. ISOTYPES: K-170070, NY-887977).

Psidium cordillerense Barb. Rodr. ex Chodat and Hassl., Bull. Herb. Boissier 7: 799. 1907. TYPE. Paraguay. "Cordillera de Altos." *Hassler 1689* (SYNTYPE: G!) and "in campis Nu-guazu." *Hassler 1687* (SYNTYPE: G!) and *Hassler1723* (SYNTYPE: G!. ISOSYNTYPES: BM-511342, K-170078, P-258474!)

Psidium glandulosum Barb. Rodr. ex Chodat and Hassl., Bull. Herb. Boissier 7: 799. 1907. TYPE. Paraguay. "Cordillera de Piribebuy." *Hassler 6633* (SYNTYPES. G [3 sheets, =ASU photos]).

Psidium macrophyllum Barb. Rodr. ex Chodat and Hassl., Bull. Herb. Boissier 7: 797. 1907. TYPE. Paraguay. "Cordillera de Altos." *Hassler 3393* (SYNTYPES: G [4 sheets, =ASU photos]. ISOTYPES: BM-511324, K-565295, NY-1288061!, P-258427!, P-258428!, W-2678!).

Psidium tomasense Barb. Rodr. ex Chodat and Hassl., Bull. Herb. Boissier 7: 797. 1907. TYPE. Paraguay. "in Colle So-Tomas." *Hassler 6554* (SYNTYPES: G [3 sheets, =ASU photos]. ISOTYPES: A-71261, MICH-1210420!, MPU-10993, NY-1288093!, P-258360!, P-258361!, S-r-9460, W-763!).

Psidium laurifolium Barb. Rodr. ex Chodat and Hassl., Bull. Herb. Boissier 7: 797. 1907. TYPE. Paraguay. "pr. Igatimi." *Hassler 4762* (HOLOTYPE: G [3 sheets, =ASU photos]).

Psidium atiraense Barb. Rodr. ex Chodat and Hassl., Bull. Herb. Boissier 7: 799. 1907. TYPE. Paraguay. "pr. Atira [3641] and in valle fluminis Y-aca pr. Chololo [6751]." *Hassler 3641* (SYNTYPES: G [3 sheets, =ASU photos]. ISOSYNTYPES: K-565296, NY-1288033!) and *Hassler 6751* (SYNTYPE: G. ISOSYNTYPE: BM-511341).

Psidium schippii Standley, Publ. Field Mus., Bot. 8: 319. 1931. Belize. "All Pines." *Schipp 595* (HOLOTYPE: F-65683. ISOTYPES: G-227694!, K-565291, MICH-1210422!, NY-1288088!).

Psidium rotundifolium Standley, Publ. Field Mus., Bot. 8: 318. 1931. Belize. "All Pines." *Schipp S-85* (HOLOTYPE: F-65682. ISOTYPES: G-227693!, MICH-1210423!, MO!, NY-1288084!, WIS-v0255107).

Mosiera guineensis (Sw.) Bisse Revista Jard. Bot. Nac. Univ. Habana 6(3): 4. 1986 ["1985"].

Shrub or small tree up to about 6 m high, typically densely covered with reddish brown to yellowish gray velvety indumentum on the inflorescence and young growth but sometimes glabrous or nearly so, the trunk smooth to scaly; *hairs* simple, usually spreading, grayish to reddish brown, ca. 0.3–0.5 mm long; *young twigs* densely to moderately velutinous, or less often glabrous, compressed to terete in section, losing indumentum in about 1 year, usually not angled but sometimes grooved when young, vigorous shoots sometimes weakly angled, the older bark usually remaining more or less smooth, less often somewhat flaky or stringy. LEAVES elliptic, elliptic-oblong, obovate, 4–11.5 cm long, 2–8 cm wide, 1.3–2.4 times as long as wide, usually densely to moderately velutinous below, glabrous to covered with hairs along the midvein above, the margin entire; *apex* obtuse, rounded, or acute; *base* rounded to acute; *petiole* 4–12 mm long, 1.5–2 mm thick, channeled, densely to sparsely pubescent, rarely glabrous; *venation* brochidodromous to eucamptodromous distally, the midvein impressed or nearly flat above, prominent below, the lateral veins 5–10 pairs, ascending at an angle of ca. 45°, diminishing and looping near the margin to connect with the next lateral, a clear marginal vein not formed, the tertiary veins, connecting the laterals in a ladder-like to reticulate pattern; *blades* coriaceous, drying yellowish brown to reddish brown, concolorous to somewhat darker above, when dry often mottled and/or lustrous above. FLOWER BUDS pyriform, 8–15(–17) mm long, the hypanthium ellipsoid to

obconic, 3.5–7 mm long, the distal portion of bud ellipsoid, subglobose, or ovoid, 4.5–10 mm long; *indumentum pattern of buds* with all external surfaces moderately to densely pubescent (rarely subglabrous), the calyx pubescent without, but less densely so than hypanthium, distally pubescent within, the petals pubescent without, the disk sparsely pubescent (less often glabrous), the style glabrous; *peduncles* terete to compressed, 9–25(–30) mm long, 1–2 mm wide, uniflorous or triflorous, the branches of the dichasium when present 2–12 mm long; *bracteoles* narrowly triangular, ca. 2–3 mm long, caducous at about anthesis. CALYX closed completely, or with a terminal, pore-like opening at the apex, tearing longitudinally to the staminal ring, usually in 5 parts, these sometimes persisting until the fruit matures, the margin of calyx pore if present sinuate or with 5 small lobes; *petals* elliptic to obovate, 7–11 mm long; *disk* 4–5 mm across; *stamens* 180–300, 7–10 mm long; *anthers* 1–3 mm long, more or less introrsely dehiscent, the glands in the connective 1 to over 50; *style* 8–10 mm long; *ovary* 3–5-locular; *ovules* 50–100 per locule, ca. 8-seriate. FRUIT subglobose to ellipsoidal, 1–3 cm long; *seeds* (22–)27–250 per fruit, 3–4 mm long. $2n = 44$. (Fig. 17).

Representative specimens examined. Abaíra, Catolés de Cima, Brejo de Altino, 13.2833°S, 41.8833°W, 1200 m, 31 Oct 1993 (fl), *Ganev 2381* (HUEFS); **Alagoinhas**, Campus II/UNEB, 12.16833°S, 38.40222°W, 16 Jan 2001 (ft), *Jesus et al. 506* (HUEFS); **Barra de Estiva**, ca. 5 km Sul de Barra da Estiva, 13.6733°S, 41.3067°W, 18 Mar 2004 (fl), *Queiroz et al. 9194* (ASU0007554); **Belmonte**, a 3 km S da cidade, 15.85°S, 38.9°W, 7 Jan 1981 (fr), *Carvalho and Gatti 455* (CEPEC); **Cachoeira**, Barragem de Bananeiras, Vale dos Rios, Paraguaçu e Jacuípe, 12.53°S, 39.0833°W, Jun 1980 (fl, fr), *Pedra do Cavalo et al. 210* (ALCB, CEPEC, HUEFS); **Caetité**, ca. 14 km ao norte de Caetité em direcão a Mamiaçu, 13.9342°S, 42.4711°W, 894 m, 12 Apr 2005 (fr), *Miranda 759* (ASU0007545); **Camaçari**, Monte Gordo entrando em frente a Guarajuba, 12.8°S, 38.25°W, 14 Jul 1983 (fl), *Bautista and Pinto 828* (HRB); **Canavieiras**, região do Cotovelo, 35 km da BA 001, 15.581389°S, 38.973056°W, 50 m, 13 Feb 2003 (fl), *Brasil 2* (HUEFS); **Caravelas**, ca. 16 km na estrada Caravelas/Alcobaca, 17.75°S, 39.25°W, 5 Sep 1989 (fr), *de Carvalho et al. 2468* (CEPEC, HUEFS); **Conde**, Praia de Sibinha, 28 Apr 1996 (fl), *Costa 42* (HUEFS); **Feira de Santana**, estrada para a Peninsula de Campinho, 12.25°S, 38.95°W, 30 Dec 1999, *Carneiro et al. 187* (HUEFS); **Ilhéus**, Quadra 1 do CEPEC, 14.81667°S, 39.033°W, 4 Jun 1978 (fl, yfr), *Santos 3227* (CEPEC, MICH); Ituaçu, Sítio Barreiras, 13.8167°S, 41.3°W, 28 May 1990 (fl), *Gouveia s.n.* (ALCB); **Itacaré**, ca. 28 km de Itacaré, Serra Grande, 13.28°S, 38.99°W, 149 m, 4 Oct 2000 (fl, fr), *Oliveira et al. 699* (ASU0007544); **Jacobina**, 11.154167°S, 40.809167°W, 960 m, 31 Mar 1996 (fr), *Guedes et al. 2707* (HUEFS); **Lençois**, adjacente ao rio Lençois, 12.559444°S, 41.403056°W, 500 m, 24 Feb 1999 (fr), *Santos 26* (HUEFS); **Licínio de Almeida**, 14.528583°S, 42.534778°W, 825 m, 29 Oct 2012 (fl), *Roque s.n.* (ASU0075032-photos); **Maraú**, estrada que liga Ponta do Mutá a Maraú, a 22 km do Porto, 14.1°S, 39°W, 6 Feb 1979 (fr), *Mori et al. 11425* (CEPEC); **Mata de São João**, estrada do Coco, em direcão a Saupe, 12.51667°S, 38.283°W, 19 Nov 1981 (fl), *Arouck et al. 148* (CEPEC, HRB, HUEFS, MBM); **Morro do Chapéu**, Estrada do Feijão, ca. 34 km de Morro do Chapéu, 11.6639°S, 40.8675°W, 855–895 m, 15 Jun 2003 (fr), *França et al. 4759* (ASU0007546); **Mucugê**, estrada Mucugê-Guiné, a 28 km de Mucugê, 12.996334°S, 41.369808°W, 7 Sep 1981 (fl), *Furlan et al. 2036* (ASU0069723); **Mucuri**, Rodovia Mucuri/Nova Viçosa (BA 001), km 8, 18.021389°S, 39.659444°W, 5 Oct 2000 (fl, fr), *Mattos et al. 4212* (HUEFS); **Palmeiras**, cerrado do Campo São João, 12.5167°S, 41.5667°W, 5 Mar 2004 (st), *Araujo et al. 41* (ASU0007558); **Rio de Contas**, 10 km da cidade em linha reta, na estrada para Rio das Pedras e Sobradinho, que saí da estrada proximo de Mato Grosso para Rio de Contas, 13.5014°S, 41.8336°W, 1067 m, 28 Nov 2004 (fl), *Harley and Giulietti 55254* (ASU0007484); **Salvador**, Parque Met. de Pituaçu, 12.970382°S, 38.512382°W, 13 Jun 1997 (fl), *Costa et al. 60* (HRB); **São Francisco do Conde**, Monte Reconcavo, Faz. E. Madruga, 12.65°S, 38.683°W, 23 Feb 1992 (fl), *Bandeira s.n.* (ALCB); **Senhor do Bonfim**, Serra do Barro Amarelo, 10.5433°S, 40.3183°W, 900 m, 28 Oct 2005(fl), *Conceição et al. 353* (ASU0007553); **Xique-Xique**, ca. 31 km S de Xique-Xique na estrada para Barra, 11.1028°S, 42.7389°W, 421 m, 15 Oct 2000 (fl), *Queiroz et al. 6455* (ASU0007547).

Phenology—Flowering throughout year but mainly from September to November; fruiting throughout year but mainly from January to March.

Habitat and Distribution—Forest, restinga, cerrado, varzea, campo, caatinga, disturbed areas from near sea level to 1650 m. *Psidium guineense* is a widespread species of disturbed habitats, ranging from northern Argentina to Mexico and the Caribbean. It has been widely introduced in subtropical and tropical areas around the world.

Distinguishing Features—Calyx closed in bud, usually tearing into 5 parts; lateral veins 5–10 pairs, usually with a ladder-like pattern of tertiary veins; indumentum of lower leaf surface more or less erect, reddish brown (less often appressed, whitish or gray); anthers 1–3 mm long, often with more than 10 glands.

I believe that *Psidium guineense* hybridizes freely with at least a few other species, namely, *P. guajava*, *P. australe*, and *P. grandifolium*. Some hybrid forms seem to be locally common. Most of the hybrids tend to be similar in having more or less obovate leaves that are usually densely appressed pubescent below. Thus it is not always clear what species has crossed with *P. guineense* to produce a hybrid. In *P. guineense*×*P. guajava* the calyx is closed or near so in the bud, while in *P. guineense*×*P. australe* the calyx is usually open. Otherwise these two hybrids can be quite similar. In *P. guineense*×*P. grandifolium* the leaves are often quite large. If one has not seen the hybrids and their parents in the field, it can be difficult to know the parentage of individuals.

Psidium guineense is contrasted with *P. guajava* and *P. grandifolium* in the discussions of those species.

14. *Psidium laruotteanum* Cambess., in Saint-Hilaire Bras. merid. 2: 282. 1833. TYPE. Brazil. "Prope Alto da Varginha (prov. Minas Geraes), "*Saint-Hilaire s.n.* (HOLOTYPE: P-258429!).

Campomanesia suffruticosa O. Berg, in Mart., Fl. bras. 14(1): 448. 1857. TYPE. Brazil. "v. in hb. Vindob. et Mart." "in prov. Ceara." *Gardner 1611* (LECTOTYPE: W-16669! [previously designated by Landrum, 1986]. ISOLECTOTYPES: BR-526717!, F-64891!, K-13353? [no collection number visible, note by Gardner], G-227703!, G-227704!, HAL-89778, K-13354!, NY-386799, P-258522!, P-258524!, SP-112, W-116295!) and *Gardner 1610* (remaining SYNTYPES: W-16668!, W-339892!, W-116293!. ISOSYNTYPES: F-64892? [no collection number visible], G-227705, K-18470!, NY-386800, P-258521!, P-258526!, P-258527!, US-117708!).

Psidium basanthum O. Berg, in Mart., Fl. bras. 14(1): 601. 1859. TYPE. Brazil. "prope Paracatu et Mugi prov. S. Pauli," *Riedel s.n.* (HOLOTYPE: LE, =ASU photo).

Psidium glaucescens O. Berg, in Mart., Fl. bras. 14(1): 600. 1859. TYPE. Brazil. "Serra da Chapada prov. Minarum," *Riedel* [*1171*]. (HOLOTYPE: LE-6978. ISOTYPES: F-65695, NY-686161!, P-258462!).

Guajava laruotteana (O. Berg) Kuntze, Rev. Gen. 239. 1891.

Guajava widgreniana (O. Berg) Kuntze, Rev. Gen. 239. 1891.

Guajava glaucescens (O. Berg) Kuntze, Rev. Gen. 239. 1891.

Guajava basantha (O. Berg) Kuntze, Rev. Gen. 239. 1891.

Myrtus bergiana Nied., in Engl. and Prantl, Naturl. Pflanzenfam. 3, Abt. 7: 66. 1893. New name for *Campomanesia suffruticosa* O. Berg.

Psidium warmingianum Kiaersk., Enum. Myrt. bras. 28. 1893. New name for *Campomanesia suffruticosa* O. Berg.

Psidium warmingianum var. ***verticillata*** Kiaersk., Enum. Myrt. bras. 28. 1893. TYPE. Brazil. "Lagoa Santa," *Lund s.n.* (SYNTYPE: C-10015970) and *Warming s.n.* (SYNTYPES: C-10015969, C-10015971, C-10015972).

Psidium savannarum Donn. Sm., Bot. Gaz.: 244. 1897. TYPE. Costa Rica. "Savana at Buenos Ayres, Comarca de Puntarenas," *Tonduz CR-4033* (HOLOTYPE: CR. ISOTYPES: BR-526720!, US-117677).

Psidium bergianum (Nied.) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 485. 1941.

Myrtus formosa Barb. Rodr., Myrt. Paraguay 16. 1903. TYPE. Paraguay. "Ipe hu....Sierra Maracayu," *Hassler 5079* (HOLOTYPE: G!, =ASU photo).

Psidium capibaryense Barb. Rodr. ex Chodat and Hassl., Bull. Herb. Boissier 7: 797. 1907. TYPE. Paraguay. "pr. Vaqueria Capibary," *Hassler 4387* (SYNTYPES: two sheets at G!, =ASU photos).

Psidium quinquedentatum Amshoff, Recueil Trav. Bot. Neer. 39: 164. 1942. TYPE. Surinam. "Upper Sipaliwini R. near Brazilian frontier," *H. E. Rombouts 329* (HOLOTYPE: U-8499. ISOTYPES: MO!, NY-1288079!).

Shrub up to ca. 1.5 m high, often less than 0.5 m high, with new shoots arising from a woody subterranean base or rhizome, densely tomentose to sparsely pubescent over most surfaces; *hairs* to ca. 1.5 mm long, grayish, yellowish white, to rusty, usually curled and tangled; *young twigs* usually densely tomentose, remaining so for more than 1 year, the bark of older twigs becoming rough and scaly. LEAVES normally opposite (rarely in whorls of 3, or spirally arranged) obovate, oblanceolate, elliptic, or oblong, 3–9(–11) cm long, 1.6–4.5(–6) cm wide, 1.6–3.2 times as long as wide; *apex* rounded, acute, or acuminate; *base* obtuse to cuneate; *petiole* 0–2 mm long, ca. 2 mm wide, tomentose; *venation* brochidodromous, the midvein flat or slightly raised above, prominent below, usually more densely hairy above than surrounding blade, the lateral veins 7–13 pairs, these weak to prominent, slightly raised above in mature leaves, ascending at an angle of ca. 45°, nearly straight, joining an equally prominent, shallowly arching marginal vein near running 1–2 mm from the margin, the tertiary veins weaker, alternating with the laterals, branching, arising from the marginal vein; *blades* stiffly coriaceous at maturity, drying gray-green to reddish brown (under hairs), the lower surface usually densely tomentose, the upper surface usually sparsely to moderately pubescent. FLOWER BUD obovoid to pyriform, 5–12 mm long, the hypanthium obconic, 2–3.5 mm long, the distal portion of bud subglobose, 3–8.5 mm long; *indumentum pattern of buds* with all external surfaces except petals densely to moderately pubescent or tomentose, the calyx sometimes notably less densely so than the hypanthium, the calyx within pubescent, the petals and style glabrous or essentially so, the disk pubescent or glabrous centrally; *peduncles* 1(–3)-flowered, solitary in the axils of leaves or bracts, 0.2–3 cm long, 1–1.5 mm wide; *bracteoles* linear to narrowly elliptic, 5–8 mm long, 1–1.5 mm wide, caducous at about anthesis. CALYX open, bowl-like, tearing slightly between the lobes, the tubular portion prolonged ca. 1 mm beyond the ovary summit, the lobes mostly broadly triangular, less often narrowly so, 1–4 mm long, 1–3 mm wide; *petals* suborbicular to obovate, 8–10 mm long; *disk* ca. 4 mm across; *stamens* 70–200, 5–9 mm long; *anthers* suborbicular, 0.5–1 mm long, with 1–4 glands; *style* 6–8 mm long; *ovary* (2–)3(–4)-locular; *ovules* 7–19 per locule, reflexed, usually uniseriate on the margin of a peltate placenta. FRUIT subglobose, 1.2–2 cm long; *seeds* 5–20, more or less rounded, 4–7 mm long. (Fig. 18).

I have seen no specimens of this species from Bahia but would expect it to be found there. A few specimens from Bahia are listed at SpeciesLink (2016).

Phenology—Flowering mainly in September and October; fruiting mainly from January to March.

Habitat and Distribution—Cerrado, campo, at elevations of 550 to 1250 m. Found from Paraná to Ceará and Mato Grosso in Brazil; also found in Paraguay, Bolivia, Surinam, Guyana, Venezuela, Colombia, and Costa Rica.

Distinguishing Features—Shrub to 1.5 m high; calyx open, the lobes triangular or subtriangular, 1–4 mm long; indumentum grayish, yellowish, or reddish brown, usually curled and tangled, obscuring the lower surface of mature leaves; marginal veins present throughout leaf, closely following the margins.

Psidium rufum DC is sometimes confused with *P. laruotteanum*. They are directly contrasted in couplet 11 of the key.

Psidium laruotteanum is variable as to leaf size and shape. Smaller plants, especially new sprouts, tend to have small elliptic leaves and larger plants tend to have larger oblanceolate or obovate leaves. Since a similar pattern is seen throughout the range, I do not suspect a genetic basis for this difference.

Psidium aerugineum and *Psidium aerugineum* var. *angustifolium* were previously cited as synonyms of *P. laruotteanum* (Landrum 2003) but I here recognize them as synonyms of *P. rufum*.

15. *Psidium myrsinites* DC., Prodr. 3: 236. 1828. TYPE. Brazil. "desertis prov. Minarum [Rio de S. Francisco]". *Martius s.n.* (HOLOTYPE: M-146869!).

Psidium myrsinoides O. Berg, in Mart., Fl. bras. 14(1): 384. 1857. **TYPE.** Brazil. "v. in hb. Vidob. et Berol." "ad Carmo et Natividade prov. Goyazensis." *Pohl 1020* (SYNTYPES: B, lost, W-16672, W-16671. ISOSYNTYPES: F-65706, K-565280).

Psidium gardnerianum O. Berg, in Mart., Fl. bras. 14(1): 389. 1857. TYPE. Brazil. Ceara. *Gardner 1610* (SYNTYPES: W-116282!, W-16680. ISOSYNTYPES: BM-796822, F-76384!, G-227710!, GH-71252, K-18450, K-18451, NY-1288049!, OXF, P-258463!, S-R-9451, US117659).

Guajava myrsinites (DC.) Kuntze, Rev. Gen. 239. 1891.

Guajava myrsinoides (O. Berg) Kuntze, Rev. Gen. 239. 1891.

Guajava gardneriana (O. Berg) Kuntze, Rev. Gen. 239. 1891.

Psidium malmei Kausel, Lilloa 33: 108. 1972. **TYPE.** Brazil. Matto Grosso, Cuyaba. *Malme 1240* (SYNTYPES: S-R-9454, S08-6868).

Tree or shrub 1–5(–9) m high, sparsely to densely pubescent on young growth to subglabrous; *hairs* whitish or tinged with reddish brown, ca. 0.5(–1) mm long; *young twigs* drying gray-green to reddish brown, often pubescent, the first bark with age becoming light gray, cracking, the older twigs rough, scaly, reddish brown to gray. LEAVES oblong, oblong-oblanceolate, obovate, or elliptic, 3.5–13.2 cm long, 1.5–4.6 cm wide, 1.5–4 times as long as wide, subglabrous or the midvein pubescent above, especially at base; *apex* bluntly acute, obtuse, or rounded; *base* rounded, obtuse, or acute; *petiole* essentially none, or ca. 1 mm long and thick, glabrous or pubescent; *venation* brochidodromous to eucamptodromous proximally, the midvein above flat or slightly raised, longitudinally wrinkled, pubescent or glabrous, prominent below, the lateral veins 5–12 pairs, not prominent, leaving the midvein at an angle of 45–60°, the marginal vein not prominent, arching broadly between laterals, running within 0.5–6 mm of the margin, often only evident distally, the tertiary veins forming an intricate dendritic pattern between the laterals; *blades* coriaceous at maturity (subcoriaceous at

anthesis), about flat, lustrous above, drying chocolate brown, darker above than below, the margins not revolute. FLOWER BUD 6–9 mm long, pyriform, the hypanthium obconic to infundibular, 2–4.5 mm long, the distal portion of bud subglobose, sometimes wider than long, 3.5–6 mm long; *indumentum pattern of buds* with the peduncles and branches of dichasia usually sparsely to moderately covered with more or less spreading hairs, less often subglabrous, the hypanthium subglabrous to sparsely pubescent but usually less densely so than peduncle, the calyx densely pubescent within, subglabrous without, the petals pubescent without, glabrous within, the disk sparsely to moderately pubescent, the style often villous proximally; *peduncles* 1(–3)-flowered, solitary in the axils of leaves or bracts, or borne at leafless nodes, 7–45 mm long, ca. 1 mm wide, usually sparsely to moderately covered with more or less erect hairs, sometimes glabrous, longitudinally wrinkled when dry, the bracts narrowly triangular, membranous, up to ca. 5 mm long; *bracteoles* narrowly triangular, 2–3 mm long, caducous before anthesis. CALYX bowl-like, tearing between the lobes ca. 1 mm at anthesis, the lobes broadly rounded, up to ca. 1.5 mm long, ca. 2–3 mm wide, sometimes scarcely detectable before anthesis; *petals* elliptic to obovate, 5–8 mm long; *disk* ca. 5 mm across; *stamens* 160–210, 6–8 mm long; *anthers* 0.5–0.9 mm long, with a terminal gland and 0–5 smaller additional glands; *style* 6–8 mm long; *ovary* 3-locular; *ovules* 17–44 per locule, ca. 2-seriate on each lamella, the placenta slightly peltate. FRUIT subglobose, up to ca. 2 cm in diam.; *seeds* 15–22, 3–5 mm long, with rounded and flat surfaces. (Fig. 19).

Representative specimens examined. Caetité, 26 Nov 1992 (fl), *Guedes 2901* (ALCB, SP); **Correntina**, cerrado ao lado da estrada entre São Manoel do Norte e Jaborandi, 13.5569°S, 44.5042°W, 685 m, 8 Apr 2005 (fr), *Miranda 725* (ASU0015768); **Formoso do Rio Preto**, ca. de 20 km de guarita da Faz. Estrondo, 11.557778°S, 46.114167°W, 450 m, 2 Feb 2000 (fr), *Passos et al. 361* (HUEFS); **Licínio de Almeida**, 14.7455°S, 42.545556°W, 854 m, 21 Jan 2013 (ofl), *Stadnik 101* (ASU0075035-photos).

Phenology—Flowering mainly from August to November; fruiting mainly from November to February.

Habitat and Distribution—Cerrado, campo rupestre at elevations of 230 to 1500 m. Found from Minas Gerais and Mato Grosso do Sul to Roraima in Brazil, and in Surinam on the border with Brazil.

Distinguishing Features—Calyx bowl-like, the lobes broadly rounded; hypanthium subglabrous to sparsely pubescent but usually less densely so than peduncle; marginal vein not prominent, arching broadly between laterals, running within 0.5–6 mm of the margin, often only evident distally; blades drying a chocolate color; petiole to ca. 1 mm long.

Psidium myrsinites can be confused with forms of *P. salutare*, which has a marginal vein that closely parallels the margin and scarcely arches (broadly arching between laterals in *P. myrsinites*); it can also be confused with forms of *P. myrtoides*, which has petioles 3–13 mm long (0–1 mm long in *P. myrsinites*) and a marginal vein that closely follows the margin (broadly arching in *P. myrsinites*).

16. ***Psidium myrtoides*** O. Berg, in Mart. Fl. bras. 14(1): 384. 1857. TYPE. Brazil. "ad vicum Ypanema prov. S. Pauli." *Sellow s.n.* (HOLOTYPE: B, lost. ISOTYPES: BM-796871, BR-848971!, F-65707, F-65708, LE-6987, P-258406!, P-258407!, SGO! [=ASU photo], W-48040!).

Guajava myrtoides (O. Berg) Kuntze Rev. Gen. 239. 1891.

Myrtus corynantha Kiaerskou, Enum. Myrt. bras. 18. 1893. TYPE. Brazil. "Rio." *Glaziou 12721* (SYNTYPE: C-10015601 [includes drawing]. ISOSYNTYPES: F-76370!, G-227807!, K-276993, P-258341!, P-258343!, US-810756!), *Glaziou 13887* (SYNTYPE: C-10015602. ISOSYNTYPES: K-566535, P-258340!, P-258342!), *Glaziou 13892* (SYNTYPE: C-10015604, C-10015605. ISOSYNTYPES: BR-528024, F-76371!, G-227808!, NY-405529, P-258344!, R-8962!) and *Glaziou 19352* (SYNTYPE: C-10015603. ISOSYNTYPES: K-566534, P-258345!).

Psidium corynanthum (Kiaerskou) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 485. 1941.

Pseudocaryophylus uniflorus Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 515. 1941. TYPE. Brazil. "Sao Paulo, Indaituba, Mun. Campinas." *C. Novaes 881* (HOLOTYPE: B, lost. ISOTYPE: SP-1390!, = ASU photo).

Psidium turbinatum Mattos, Loefgrenia 94: 12. 1989. TYPE. Brazil. "Goiás, Serra do Espinhaco." *Irwin, Harley and Onishi 29043* (HOLOTYPE: IPRN. ISOTYPE: NY-1365090!).

Psidium hagelundianum Mattos, Loefgrenia 94: 11. 1989. TYPE. Brazil. "Sao Paulo, Salesopolis, Estacão Biológica de Boraceia, perto do Rio Coruja." *Mattos 14251* (HOLOTYPE: IPRN. ISOTYPE: SP! [see http://cotram.org/collections/individual/index.php?occid=2909812&clid=0].

?***Psidium imaruinense*** Mattos, Loefgrenia 66 ["65"]: 1." 1975. TYPE. Brazil. Santa Catarina, Imarui, Alto Dio D'Uha, 100 m, 10 May 1973. *Bresolin 747* (HOLOTYPE: FLOR. ISOTYPE: MBM-fragments [=ASU photo]).

?***Psidium canum*** Mattos, Loefgrenia 94: 11. 1989. Brazil. Distrito Federal, Parque Guará, 19 Feb 1971. *Heringer 11209* (HOLOTYPE: IPRN not found).

Tree or shrub 1–8 m high, essentially glabrous except for inner surfaces of some floral structures, or sparsely puberulent on twigs, and sometimes leaf bases and petioles; *hairs* whitish, up to ca. 0.2 mm long; *young twigs* yellow-brown to light reddish brown, smooth, the first bark eventually becoming gray, splitting in longitudinal flakes, the new inner bark reddish brown. LEAVES elliptic, narrowly elliptic, or lanceolate, sometimes slightly oblique, 3.9–13.2 cm long, 1.4–5.5 cm wide, 1.7–3.4 times as long as wide; *apex* usually acuminate; *base* acuminate to acute; *petiole* channeled, 3–13 mm long, 1–2.5 mm thick; venation brochidodromous, the midvein prominent below, impressed proximally to nearly flat distally above, the lateral veins prominent to obscure, 10–17 pairs, straight, leaving midvein at 45–60°, the marginal veins arching between between laterals, running more or less parallel to the margin, mostly 0.5–3 mm from the margin, the tertiary veins dendritic, alternating with the laterals, appearing to arise from the marginal veins; *blades* coriaceous at maturity, drying gray-green to reddish brown. FLOWER BUDS broadly to narrowly pyriform, 4–8 mm long, the hypanthium obconic, subcylindrical, campanulate or infundibular, 1.5–3 mm long, the distal portion of bud subglobose 2–5 mm long; *indumentum pattern of buds* with all surfaces glabrous or essentially so except for the pubescent inner surface of calyx lobes and sometimes disk; *peduncles* 2–9 mm long, 0.5–1 mm thick, borne in axils of leaves or bracts or at leafless nodes, often clustered in bracteate shoots, these sometimes terminating in leaves; *bracteoles* narrowly triangular to narrowly lanceolate, 1–2(–4) mm long, caducous at about anthesis. CALYX bowl-like or bowl-like, open, the lobes broadly triangular or rounded, 0.5–1 mm long, borne along the edge of the bowl, the staminal ring borne on inner surface, the tears between calyx lobes scarcely penetrating the staminal ring if at all; *petals* elliptic, 6–7 mm long; *disk* within staminal ring ca. 1–2 mm across; *stamens* 125–200, ca. 5 mm long; *anthers* 0.4–0.6 mm long, with a terminal gland and sometimes 1–3 smaller glands in the connective below; *style* 5–7 mm long, the stigma scarcely wider than the style; *ovary* 2–3-locular, the locules glabrous to pubescent within; *ovules* 7–21, usually uniseriate on each

lamella of a slightly to clearly peltate placenta. FRUIT globose to pyriform, up 2.3 cm long, the wall 0.5–1.5 mm thick; *seeds* 2–10, 5–8 mm long, smooth, with rounded and flat surfaces. (Fig. 20.)

Representative specimens examined. Maracás, ca. 5 km da cidade de Maracás, 13.45306°S, 40.46444°W, 890 m, 1 Mar 1999(fr), *Melo et al. 2625* (ASU0059724, HUEFS); **Porto Seguro,** Monte Pascual, 16.44972°S, 39.06444°W, *Belem and Pinheiro 2691* (CEPEC); **Rio de Contas**, mata da base do pico do Itoibira, ca. 13. 59°S, 41.81°W, 1700 m, 10 Feb 1999 (fr), *Nascimento 124* (HUEFS).

Phenology—Flowering from September to January; fruiting January to May.

Habitat and Distribution—Forests and campo rupestre at 850 to 1700 m; from Bahia and Goiás to Paraná. Rarely cultivated.

Distinguishing Features—Nearly glabrous; calyx bowl-like, open, the lobes broadly triangular or rounded, the tears between lobes not penetrating the staminal ring significantly; peduncles often clustered in bracteate shoots, these sometimes terminating in leaves; petiole channeled, 3–13 mm long; marginal veins running more or less parallel to the margin, mostly 0.5–3 mm from the margin.

17. *Psidium nutans* O. Berg, in Mart., Fl. bras. 14(1): 394. 1857. TYPE. Brazil. "in prov. Piauhiensi." *Gardner 2592* [=*2598* on some specimens] (SYNTYPES: W-16673, W-116302!. ISOSYNTYPES: BM-796904, F-76389!, G-227721!, NY-1288066!, P-258405!, US-7838).

Guajava nutans (O. Berg) Kuntze, Rev. Gen. 239. 1891.

Psidium campicolum Barb. Rodr., Myrt. Paraguay 11. 1903. TYPE. Paraguay. "in regiones fluminis Corrientes." *Hassler 4522* (HOLOTYPE: G-194283).

Psidium mattogrossense Barb. Rodr. ex Chodat and Hassl., Bull. Herb. Boissier 7: 799. 1907. TYPE. Paraguay. "pr. Valenzuela." *Hassler 7135* (HOLOTYPE: [two sheets, =ASU photos]).

Psidium verrucosum Barb. Rodr. ex Chodat and Hassl., Bull. Herb. Boissier 7: 799. 1907. TYPE. Paraguay. "pr. Tobaty." *Hassler 6384* (HOLOTYPE: G [=ASU photo]).

Psidium popenoei Standley, Ceiba 1: 41. 1950. TYPE. Honduras. Comayagua, Siguatepeque, *Standley and Chacon 6369* (HOLOTYPE: F-76375!).

Tree or shrub 1–5 m high, glabrous or sparsely appressed antrorsely pubescent on distal inner surface of calyx (rarely puberulent on young growth); *hairs* if present colorless, to ca. 0.5 mm long; *young twigs* reddish brown to blackish brown when dry, smooth with numerous darker glands, the bark of older twigs lighter brown or tan, falling as flakes. LEAVES elliptic to obovate, 5–17 cm long, 3–12 cm wide, 1.4–2.6 times as long as wide; *apex* acute, acuminate, obtuse to rounded, often with a cuspidate tip; *base* cuneate, obtuse, rounded, oblique, or subcordate; *petiole* shallowly channeled, 3–10 mm long, 1–2.5 mm thick; *venation* eucamptodromous proximally, brochidodromous distally, the midvein impressed proximally to nearly flat above, prominent below, the lateral veins 4–8(–10) pairs, leaving the midvein at an angle of 30–60°, nearly straight near midvein, arching distally towards apex, the marginal vein usually evident distally, arching mostly between 1–3 mm from the margin, the tertiary veins dendritic to ladder-like in pattern; *blades* coriaceous, often lustrous above and below, drying reddish to blackish brown, often mottled above with lighter spots when dry, the margin sometime crenulate in part. FLOWER BUDS pyriform, moderately to strongly constricted at ovary summit, 7–12(–14) mm long, the hypanthium ellipsoid to campanulate, 3–6 mm long, the distal portion of bud ovoid to subglobose, 4–6.5(–9.5)

mm long; *indumentum pattern of buds* with all surfaces glabrous or essentially so; *peduncles* 1–3-flowered, 0.4–2 cm long, flattened, 1–2 mm wide, the branches of the dichasia 0.4–1 cm long; *bracteoles* narrowly triangular, ca. 2 mm long, caduceus at or before anthesis. CALYX closed, or with a small apical pore-like opening, with 5 minute lobes on the margin of the opening, tearing irregularly at anthesis, usually in 4–5 persistent pieces 4–8 mm long, the tears not cutting the staminal ring, glabrous to sparsely pubescent distally within; *petals* elliptic to obovate, 0.8–1.4 cm long; *disk* ca. 3.5 mm across; *stamens* 110–240, 6–10 mm long; *anthers* 1.2–2(–3) mm long, with a few to several glands in the connective; *style* 9–13 mm long, the stigma peltate, 0.5–0.8 mm across; *ovary* 3–5-locular; *ovules* 50–105 per locule, the placenta protruding, sometimes somewhat peltate. FRUIT globose, to subpyriform, 0.7–2 cm long; *seeds* numerous (50 in one fruit), subtriangular with rounded edges, 3–4 mm long. (Fig. 21.)

Representative specimens examined. Conde, Barra do Itarari, 11.9667°S, 37.6167°W, 26 Apr 1996 (fr), *Costa 18* (ASU0008006); **Palmeiras**, Campo São João, 12.4522°S, 41.4881°W, 23 Oct 2000 (fl), *Nunes et al. 193* (ASU).

Phenology—Flowering mainly from October to January; fruiting mainly January to February.

Habitat and Distribution—Apparently humid grasslands or riparian habitats at elevations of 150 to 750 m. Found in Pará, Amazonas, Piauí, Bahia and Minas Gerais in Brazil; also found in Argentina, Paraguay, Bolivia, and Venezuela.

Distinguishing Features—Usually glabrous or nearly so; calyx closed, or with a small apical pore-like opening, with 5 minute lobes on the margin of the opening, tearing in 4 or 5 lobes at anthesis; anthers 1.2–2(–3) mm long; tertiary veins dendritic to ladder-like in pattern.

Psidium nutans is quite similar to *P. guineense*, except that it generally lacks abundant indumentum of that species. There seems to be a habitat difference: *P. guineense* usually in drier habitats and *P. nutans* often growing along streams or in wet grasslands. This is a species that requires further study but it is provisionally accepted here because it seems to be ecologically distinct from *P. guineense*.

18. *Psidium oligospermum* DC., Prodr. 3: 236. 1828. Brazil. "prov. Bahiensis." TYPE. *Martius* [*2203*]. (HOLOTYPE: M-146868! [specimen annotated by de Candolle with description by Martius]. ISOTYPE: M-146867).

Calyptranthes eugenioides Cambess., Fl. Bras. merid. 370. 1833. TYPE. Brazil. Bahia, "prope Bom Jardim…provinciae Minas Geraes." *St. Hilaire* s.n. (SYNTYPES: P-801004 ["Type"], P-801005, P-801006["Isotype"]. ISOSYNTYPE: MPU-10976).

Psidium galapagaeum Hook. f., Trans. Linn. Soc. 20: 224. 1847. TYPE. Ecuador. Galapagos, "James Island" [=Isla Santiago]. [*Scouler s.n.*] (LECTOTYPE [designated by Porter, 1969]: K-565485).

Mitranthes eugenioides (Cambess.) O. Berg, Linnaea 27: 317. 1856.

Mitranthes gardneriana O. Berg, in Mart., Fl. bras. 14(1): 354. 1857. TYPE. Brazil. "prov. Alagoas." *Gardner 1311* (HOLOTYPE: W. ISOTYPES: F-65402, F-76367!, K-18789, K-18790, NY-405343, NY-405344, P-258499!, P-258500!, P-258501!).

Mitranthes sartoriana O. Berg, Linnaea 29: 248. 1858. TYPE. Mexico, Vera Cruz, "prope Mirador." *C. Sartorius* (HOLOTYPE: location not stated, B? ISOTYPE: G-227668!).

Calycorectes protractus Griseb., Cat. Pl. Cub. 284. 1866. TYPE. Cuba. "Cuba Occ., pr. Hanabana." *Wright* [*3557*]. (HOLOTYPE: GOET. ISOTYPES: GH-68862, K-170083, US-118238!).

Guajava oligosperma (DC.) Kuntze, Rev. Gen. 239. 1891.

Psidium sartorianum (O. Berg) Niedenzu, Nat. Pflanzen. Fam. 3(7): 69. 1893.

Psidium eugenioides (Cambess.) Ndzu., in Engler and Prantl, Nat. Pflanzenfam. 3(7): 69. 1893. Illegitimate combination. An earlier homonym is *Psidium eugenioides* Cambess..

Calyptranthes tonduzii Donn. Smith, Bot. Gaz. 23: 245. 1897. TYPE. Costa Rica. San Jose, Río Virilla. *Tonduz CR-9822* (HOLOTYPE: CR. ISOTYPES: BM-796882, BR-530471, BR-530438, G-227669!, K-330940, M-137148, MO-187176, NY-386754, US-117854 [annotated as holotype], US-731227!, US-117855).

?***Myrtus paucinerve*** Urban, Symb. Ant. 9: 82. 1923. TYPE. Cuba. Prov. Oriente prope Río Piloto. *Ekmann 2505* (HOLOTYPYE: B, lost).

Psidium claraense Urban, Symb. Ant. 9: 466. 1928. TYPE. Cuba. Prov. Santa Clara prope Casilda. *Ekmann 18887* (HOLOTYPE: B, lost. ISOTYPES; A-71238, G-227690!, NY-1288040!, S-r-8385 [annotated as lectotype by Urquiola,1997 but apparently never published]).

Psidium microphyllum Britton, Botany of Puerto Rico and the Virgin Islands, 555. 1930. TYPE. Puerto Rico Mayaguez Experiment Station, July 1930. *T. B. McClelland s.n.* (HOLOTYPE: NY-1365088!).

Psidium socorrense I. M. Johnst., Proc. Calif. Acad. Sci. 20: 81. 1931. TYPE. Mexico. Revillagigedo Islands, on east slope of Socorro Island. *Mason 1639* (HOLOTYPE: CAS-4159. ISOTYPES: GH-71233, K-565290).

Mitropsidium oligospermum (DC.) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 486. 1941.

Mitropsidium eugenioides (Cambess.) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 486. 1941.

Mitropsidium oblanceolatum Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 487. 1941. TYPE. Colombia. Santa Marta. *H. H. Smith 403* (HOLOTYPE: B, lost. ISOTYPES: CM-1521, F-65406, GH-71039, K-565517!, LL-208130, MICH-1109446, NY-1365084!, NY-1365085!, P-258374!, P-258375!, S-7-8339, S-5-3134, TEX-372173, U-5187, WIS-255103, US-731229!, US-117681).

Mitropsidium pittieri Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 488. 1941. TYPE. Venezuela. La Guairita, bei Petare, Miranda, am Wegrand." *H. Pittier 9277* (HOLOTYPE: B, lost. ISOTYPE: NY-405350, VEN!).

Mitropsidium sartorianum (O. Berg) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 15: 487. 1941.

Psidium yucatanense Lundell Contr. Univ. Michigan Herb. 7: 35. 1942. TYPE. Belize. Belize Dist., Belize-Sibun Road. *Gentle 9* (HOLOTYPE: MICH-1210419!. ISOTYPES: F-65684, K-565289, NY-1365092!, US-117680!).

Psidium solisii Standley, Field Mus. Nat. Hist., Bot. Ser. 23: 133. 1944. TYPE. Costa Rica. "Hatillo, Finca de J. F. Rojas, 1100 m, 26 Dec 1936." *Solís 509* (HOLOTYPE: F-76376!).

Psidium molinae Amshoff, Acta Bot. Neerland. 5: 277. 1956. TYPE. Honduras, Dept. Morazán: trail from La Quince, El Zamorano, to El Jicarito, 800-900 m, 15 Jul 1949. *P. C. Standley 21255.* (HOLOTYPE: F-76374!).

Psidium sartorianum var. ***yucatanense*** (Lundell) McVaugh, Fieldiana, Bot. 29: 527. 1963.

Psidium galapageium var. ***howellii*** D. M. Porter, Ann. Missouri Bot. Gard. 55: 370. 1969. TYPE. Ecuador. Galapagos Islands, Isla San Cristobal (Chatham Island), 3.5 km above Puerto Bacque, along road to El Progreso, 8 Feb 1967. *Wiggins and Porter 398.* (HOLOTYPE: MO. ISOTYPES: CAS-4158, GH-71251, NY-1288048!).

Psidium protractum (Griseb.) Lundell, Wrightia 5(3): 70. 1974.

Tree up to ca. 30 m high, glabrous or sparsely to moderately pubescent on young growth; *hairs* simple, whitish, yellowish or reddish brown, minute or up to ca. 0.2(–0.4) mm long, curly, suberect or antrorse; *young twigs* reddish brown to light yellow-green, glabrous to moderately pubescent, in age becoming glabrescent, gray, smooth, or slightly striate. LEAVES lanceolate to elliptic, 1.6–7.5(–8.3) cm long, 0.4–3.3 cm wide, 1.7–4(–5) times as long as wide, glabrous, or often sparsely pubescent along the margin and midvein above, the margin entire; *apex* sharply or obtusely acuminate, acute, or less often obtuse; *base* rounded, cuneate, acuminate; *petiole* channeled or not, 1–6 mm long, 0.3–1 mm wide, glabrous or pubescent; venation brochidodromous, the midvein about flat or less often slightly impressed proximally above, prominent below, the lateral veins weak, 4–10 pairs, leaving the midvein at an angle of ca. 45°, united

near the margin by a broadly arching marginal vein, tertiary veins usually obscure, dendritic, appearing to arise mainly from the marginal vein; *blades* coriaceous to subcoriaceous, drying dark olive-green, reddish brown, or nearly black, often mottled with lighter spots above when dry, or sometimes the whole upper surface grayish. FLOWER BUD pyriform to subfusiform, 3–9 mm long, the hypanthium obconic to campanulate, 1–4 mm long, the distal portion of bud ovoid to subglobose, 2.5–6 mm long; *indumentum pattern of buds* with all external surfaces glabrous to sparsely puberulent or pubescent (rarely moderately so), the hypanthium and calyx often with less indumentum than peduncle, the calyx within glabrous to puberulent, often with an apical tuft of hairs, the petals glabrous or ciliate, or sometimes pubescent if exposed in the bud; disk within the staminal ring usually glabrous, the staminal ring sparsely puberulent, the style glabrous or sparsely puberulent proximally; *peduncles* 6–25 mm long, 0.5–1 mm wide, solitary, uniflorous, or less often triflorous, the branches of the dichasium up to ca. 7 mm long; *bracteoles* narrowly triangular to linear, 1–5 mm long, caducous before anthesis. CALYX completely closed, sometimes with an apiculate apex, or scarcely open with a sinuate margin, or with 4 or 5 short verrucose protuberances at the apical tip, thus appearing puckered at the apex, circumscissile above the staminal disk or tearing in 5 lobes or irregularly at anthesis, persisting briefly as a disk-shaped or conical calyptra or calyx pieces, the remains of the calyx usually falling before the fruit matures, the staminal disk borne on inner surface of the bowl-like calyx tube, the tube tearing as the fruit matures, the calyx (including tube with stamens) sometimes evident only as a circular scar in mature fruits; *petals* suborbicular, 2.5–6 mm long (perhaps sometimes falling with the calyptra); *disk* 1–5 mm across; *stamens* 4–12 mm long, 80–220; *anthers* 0.3–0.5 mm long, with a terminal gland and up to 4 smaller glands below; *style* 4–5 mm long; *ovary* 2–3-locular; *ovules* (4–)10 – 34 per locule, uniseriate or biseriate on each lamella, the placenta slightly peltate. FRUIT subglobose to pyriform, 5–25 mm long; *seeds* 1–13 per fruit, 3–7 mm long, sublenticular to hemispheric, usually with somewhat angular edges and at least one nearly flat surface. (Fig. 22.)

Representative specimens examined. Água Fria, estrada para Cia de Celulose da Bahia, 11.83°S, 38.7°W, 20 Aug 1984 (fr), *Santos and Lima 176* (CEPEC, HRB, RB); **Alagoinhas**, Campus II/UNEB, Rodovia Alagoinhas-Salvador, km 03, 12.1683°S, 38.4022°W, 1 Oct 2001 (fr), *Jesus 1379* (HUEFS); **Biritinga**, 11.6°S, 38.75°W, 19 Feb 1978 (fr), *Orlandi 165* (HRB); **Cachoeira**, Faz. Favela, 20 Sep 1992 (fl, fr), *Guedes et al. s.n.* (ALCB, CEPEC, HRB, HUEFS); **Camaçari**, na rodovia que liga a BA-099 (estrada do coco) à via Parafuso, 12.8°S, 38.35°W, 14 Jul 1983 (fr), *Pinto and Bautista 330* (ALCB, CEPEC, HRB, NY); **Campo Formoso**, Lagoa Grande, Poços, 10.5875°S, 40.41861°W, 828 m, 29 Oct 2005 (fr), *Moraes et al. 62* (ASU0057333); **Catu**, Campo de Santana, 12.5°S, 38.7°W, 31 Jul 1990 (fl), *Ferreira 307* (HRB); **Conceição do Jacuípe**, 12.3°S, 38.7667°W, 1 Nov 2001, *Moraes 481* (HUEFS); **Conde**, Mata do Bu, 11.813322°S, 37.60967°W, 22 Jun 2003, *Hatschbach et al. 75625* (HRB, HUEFS); **Coração de Maria**, 10 km SE de Feira de Santana, 12.25°S, 38.83°W, 22 Sep 1995 (fr), *França et al. 1338* (ASU0014341); **Entre Rios**, área de poços da Petrobras, 11.8856°S, 37.9536°W, 90–100 m, 25 Feb 2005 (fr), *Carvalho-Sobrinho et al. 361* (ASU0015762); **Esplanada**, caminho para Sitio do Conde, Fazenda Chapada, 11.7592°S, 37.8514°W, 526 m, 9 May 2000 (fr), *Lima et al. 71* (ASU0014321); **Feira de Santana**, Campus da UEFS, 12.25°S, 38.95°W, 21 Sep 1995 (fr), *França et al. 1330* (ASU0014323); **Itapicuru**, Rod. Itapicuru/Tobias Barreto (SE), km 4, 11.2939°S, 38.19°W, 16 Jun 1994 (yfr), *Sant'Ana et al. 484* (ASU0014367); **Jacobina**, Bairro Grotinha, 11.195°S, 40.505°W, 525 m, 23 Jun 1999 (fr), *França et al. 3061* (ASU0015765); **Jeremoabo**, Fazenda Natureza do Sr. Otávio Farias, ca. 20 km NO do município caminho para o Saco dos Cavalos 10.003889°S, 38.433889°W, 427 m, 12 Aug 2005 (fr), *Miranda et al. 894* (ASU0057470); **Mata de São João**, estrada para as Duna do Diogo, 12.4631°S, 37.9506°W, 21 Jan 2004 (yfr), *Souza 453* (ASU0014390, HUEFS); **Ribeira do Pombal**, km 20 da

rodovia Tucano, depois entra à dereita estrada de areia até a Fazenda de Zé do Erasmo, 10.9°S, 38.67°W, 400 m, 9 Jun 2005 (fr), *Cardoso 565* (ASU0015763); **Salvador**, área de Pituaçu (UCSal), 12.95167°S, 38.42°W, 15 Feb 1992(fr), *Bautista et al. 1610* (ALCB, HRB); **São Sebastião do Passé**, Lamarão do Passé, 12.5167°S, 38.4°W, 21 Sep 1984 (fr), *Noblick and Lemos 3381* (ALCB, ASU0015769, CEPEC, HUEFS); **Tucano**, 10.9167°S, 38.6833°W, 22 May 1984 (fr), *Oliveira Filho 164* (ALCB, CEPEC, HRB, MBM).

Phenology—Flowering and fruiting throughout year, probably mainly in spring months.

Habitat and Distribution—Forests, caatinga, cerrado, and resting at elevations of 25 to 850 m (at higher elevations outside of Brazil). Mexico to northwest Argentina, Caribbean islands to São Paulo, Brazil; Galapagos and Isla Socorro in eastern Pacific.

Distinguishing Features—Calyx closed or nearly so, if open usually with 4 to 5 minute lobes at the apex, glabrous to puberulent, falling as a calyptra above the stamens or tearing between apical lobes; leaves lanceolate to elliptic; fruit subglobose to pyriform, 5–25 mm long, with a circular terminal scar, with evidence of the staminal ring lost or nearly lost; seeds 1–13 per fruit, 3–7 mm long.

As recognized here *Psidium oligospermum* is a widespread and variable species. Characters that vary are: habit tree versus shrub; flower bud size; presence or absence of dichasia; closure of calyx with or without an apical pore; presence or absence of apical protuberances on the calyx; mode of tearing of calyx; indumentum density and hair size; leaf size, shape, and thickness; fruit size and shape. The most commonly used name has been *P. sartorianum*, but a few other specific epithets have priority as long as a broadly defined species is recognized.

Variations in the calyx (closed or nearly so, falling as a calyptra vs. slightly open with apical protuberances and tearing between apical lobes) have caused taxonomists to recognize more than one taxon in some areas. Examples of this bimodal variation are found in the Galapagos Islands (where the names *P. galapageium* var. *galapageium* and *P. galapageium* var. *howellii* have been used) and in Honduras (where *P. sartorianum* and *P. molinae* have been used).

In Bahia a similar situation exists and two usually distinct species are recognized: *P. oligospermum* and *P. schenckianum*. These entities hybridize and the hybrids are often similar to specimens of *P. oligospermum* from other regions. Thus, one potential explanation for the pattern of variation is that *P. oligospermum* originated in the area of Bahia (a region of high diversity in *Psidium*), acquired genes of *P. schenckianum* through hybridization and has carried those genes to other regions. A second hypothesis might be that the ancestor of the *P. oligospermum* complex had enough genetic variability in it that it was able to evolve two forms in multiple areas. In Bahia, these forms are distinct enough that they are called separate species.

A geographically broad study with molecular techniques of *Psidium oligospermum*, including related species such as *P. schenckianum*, *P. glaziovianum*, and *P. appendiculatum* would be valuable. Working in the Atlantic Rainforest of Brazil, Tuler et al. (2015) have found that specimens they identified as *P. oligospermum* and *P. sartorianum* differ in the molecular characters they used. This kind of study should help to better understand this widespread and taxonomically difficult complex.

19. *Psidium rhombeum* O. Berg, in Mart., Fl. bras. 14(1): 383. 1857. TYPE. Brazil. "v. in hb. Berol. et Mart.," "in montibus Serra d' Açurua [ca. 11.5 S, 42.5W] prov.

Bahiensis." *Blanchet 2815* (SYNTYPE: B, lost. SYNTYPE: BR-843780. ISOSYNTYPES: BM-796890, E-167673, F-76392!, F-76393!, G-227662, HAL-89786, K-18449, K-18703, LE-7000. MICH-1210407!, P-258386!, W-48296).

Guajava rhombea (O. Berg) Kuntze, Rev. Gen. 239. 1891.

Tree or shrub to ca. 3 m high, the young growth thinly puberulent and densely glandular on young twigs, leaves, and flowers; *hairs* yellowish or whitish, 0.5–1 mm long, erect to antrorse, straight to somewhat curled; *young twigs* reddish brown, pubescent, glandular, the older twigs grayish, slightly rough. LEAVES elliptic to suborbicular, to obovate, 2.2–6 cm long, 1.5–4 cm wide, 1.3–2 times as long as wide, with 12–20 glands per mm , the leaves subtending proximal peduncles sometimes reduced, ca. 1 cm long; *apex* acuminate to rounded; *base* acuminate, gradually merging with petiole; *petiole* 3–7 mm long, 0.8–1 mm wide, slightly channeled or flat, the leaf blade sometimes narrowly decurrent along the petiole; *venation* brochidodromous distally, eucamptodromous proximally, weak to scarcely distinguishable in young leaves, prominent in older leaves, the midvein prominent or not below, flat to slightly recessed above, the lateral veins 6–10 pairs, sometimes sigmoidal, leaving the midvein at an angle of 30–45°, the marginal vein connecting laterals in broad arcs, 1–2 mm from the margin, the tertiary veins dendritic; *blades* membranous at anthesis, submembranous to chartaceous at maturity. FLOWER BUDS pyriform, 4–5 mm long, the hypanthium obconic to campanulate, ca. 1.5 mm long, the distal portion of bud subglobose, 2.5–3.5 mm long, sometimes wider than long; *indumentum pattern of buds* with all external surfaces and style glabrous, the inner surface of calyx and staminal ring pubescent, the petals ciliate, the bracteoles ciliate; *peduncles* uniflorous, axillary or at leafless nodes, 3–14 mm long, 0.4–0.5 mm wide; *bracteoles* linear, ca. 3 mm long, ca. 0.3 mm wide, caducous at or before anthesis, ca. 1.5 mm long. CALYX open, bowl-like, 2–3.5 mm long, with a sinuate margin or triangular lobes distally, tearing between the lobes (or in part irregularly) at anthesis, the lobes after anthesis somewhat irregularly oblong, ca. 3 mm long; *petals* suborbicular, 2–5 mm long, unequal, glandular; *disk* 2–3 mm across; *stamens* 50–111, ca. 3–4 mm long; *anthers* ca. 0.5 mm long, oblong, with a solitary terminal gland; *style* ca. 3.5 mm long, the stigma slightly wider than style; *ovary* 2–3-locular; *ovules* 3–7 per locule, the placenta peltate. FRUIT subglobose, probably ca. 10 mm long at maturity; *seeds* 1–5 seen in developing fruits. (Fig. 23.)

Representative specimens examined. Casa Nova, dunas interiores do São Francisco, 9.414722°S, 41.151944°W, 414 m, 30 Nov 2003 (fl), *Queiroz et al. 8075* (ASU0057058); **Glória**, Brejo do Brugo-Baixa de Fontana, 9.3°S, 38.3°W, 9 Mar 2004 (fr), *Moraes 626* (ASU0008243); **Limoeiro,** Pilão Arcado, 10.141389° S, 42.907778° W, 427 m, 19 Mar 2006 (fr), *Souza 1599* (HUEFS, seen online only).

Phenology—Flowering in November; fruiting in March.

Habitat and Distribution—Dunes and probably other well drained soils at elevations of ca. 400 m. Known to me only from Bahia but possibly occurring in adjacent states to the north.

Distinguishing Features—Young growth thinly puberulent and densely glandular on young twigs, leaves, and flowers; calyx in flower open, bowl-like; lateral veins connecting to a marginal vein only in distal half of leaf; leaves mainly less than 5 cm

long; petals 2–5 mm long; flower buds 4–5 mm long; petiole 3–7 mm long; seeds 1–5.

Psidium rhombeum may be confused with *P. glaziovianum* because they have similar membranous to submembranous leaves at anthesis. But *P. glaziovianum* has with narrower leaves and a nearly closed calyx. *Psidium sp. B* is similar but is covered with yellowish tomentum on young growth and lower leaf surfaces. *Psidium sp. C* is similar but has a closed rostrate calyx.

20. *Psidium riparium* DC., Prodr. 3: 235. 1828. TYPE. Brazil. "in Brasilia." *Martius s.n.* (2 specimens at M, one annotated by de Candolle taken as HOLOTYPE: M-32380. Additional specimen perhaps an ISOTYPE: M-32381).

Psidium mengahiense Cambess., in Saint-Hilaire Fl. Bras. merid. 2: 286. 1833. TYPE. Brazil. "Prope Mengahi in provincia Minas Geraes." *Laruotte s.n.* (SYNTYPES: P-258422! marked "type," P-258423! marked "isotype," P-258424! marked "isotype").

Psidium maranhense O. Berg, in Mart., Fl. bras. 14(1): 386. 1857. TYPE. Brazil. "v. in hb. Mart. et Vindob." "ad flumen Rio Maranhao in prov. Goyazensi," *Pohl s.n.* (SYNTYPES: BR-843784!, W-16670. Possible ISOSYNTYPE: OXF, =ASU photo).

Psidium paraense O. Berg, Fl. bras. 14(1): 386. 1857. TYPE. Brazil. "in vicinia urbis Santarem prov. Paraensis." *Spruce 316* (HOLOTYPE: M-146863!. ISOTYPES: MICH-1210410!, NY-1288082!).

Psidium sieberianum O. Berg, in Mart., Fl. bras. 14(1): 387. 1857. TYPE. Brazil. "v. in hb. Mart." "in prov. Paraensi." *Sieber s.n.* (SYNTYPES: BR-843787!, BR-843786!, the types of varieties listed below).

Psidium sieberianum var. ***gracile*** O. Berg, in Mart., Fl. bras. 14(1): 387. 1857. TYPE. Brazil. "v. in hb. Mart." "in prov. Paraensi." *Sieber s.n.* (HOLOTYPE: BR-843787!).

Psidium sieberianum var. ***robustum*** O. Berg, in Mart., Fl. bras. 14(1): 387. 1857. TYPE. Brazil. "v. in hb. Mart." "in prov. Paraensi." *Sieber s.n.* (specimen annotated by Berg taken as HOLOTYPE: BR-843786!. Possible ISOTYPE: M-32384).

Guajava maranhensis (O. Berg) Kuntze, Rev. Gen. 239. 1891.

Guajava mengahiensis (Cambess.) Kuntze, Rev. Gen. 239. 1891.

Guajava paraensis (O. Berg) Kuntze, Rev. Gen. 239. 1891.

Guajava riparia (DC.) Kuntze, Rev. Gen. 239. 1891.

Guajava sieberiana (O. Berg) Kuntze, Rev. Gen. 239. 1891.

Psidium insulincola S. Moore, Trans. Linn. Soc. ser. 2, 4: 353. 1895. Brazil. Mato Grosso, "inter Santa Cruz et Diamantino," *S. Moore 624* (HOLOTYPE: BM-796880!. ISOTYPE: NY-1288081!).

Myrtus thyrsodea O. Kuntze, Rev. Gen. 3(2): 92. 1898. Brazil. "Matto-grosso: Cuyaba," *Kuntze s.n.* (HOLOTYPE: NY-405541. ISOTYPE: US-810757!).

Psidium thyrsoideum (O. Kuntze) K. Schum. Just's Bot. Jahresber. 26(1): 359. 1898.

One syntype collection of *Aulomyrcia goyazensis* O. Berg (Mart. Fl. bras. 14[1]: 85. 1857) is *Gardner 3184*. Specimens at G and K with the label *Gardner 3184* are *Psidium riparium*. There seems to be a confusion of labels because other specimens with the same collector and number at K, P, NY, and W (the only collection cited by Berg) are *Myrcia* (which now includes *Aulomyrcia*). The description of Berg of *Aulomyrcia goyazensis* matches *Myrcia* (e.g., 4-ovulate ovary). So this name is not considered a synonym for *Psidium riparium*.

Tree or shrub 1.5–6 m high, essentially glabrous except for calyx and bracteoles within, or more commonly sparsely to densely villous to pubescent on young growth and inflorescences; *hairs* whitish or yellowish, mainly erect, up to ca. 1 mm long; *young twigs* gray, light reddish brown to yellowish brown, usually pubescent or villose, the first bark darkening and flaking off to reveal smooth, light reddish brown inner bark. LEAVES lanceolate, usually narrowly so, or narrowly elliptic (rarely ovate), often slightly falcate, (4.5–)5.4–16.5 cm long, 1.5–4.6 cm wide, 2.2–6.9 times as long as

wide, subglabrous to moderately or sparsely pubescent (especially along midvein), glabrous to sparsely pubescent above; *apex* acute, or less often obtuse or acuminate; *base* rounded or cordate, less often acute; *petiole* shallowly channeled or unchanneled, glabrous to densely pubescent or villous, 1–13 mm long, 1–2 mm wide; *venation* principally brochidodromous, but sometimes partially eucamptodromous, the midvein prominent below, about flat above, the lateral veins 10–17 pairs, weak to moderately prominent, leaving midvein at an angle greater than 45°, the marginal vein arching between the laterals, within 0.5–7 mm from the margin, the tertiary veins weak or strong, connecting the larger veins in an irregular dendritic pattern; *blades* subcoriaceous, drying dark reddish brown to gray-green. FLOWER BUDS pyriform, sometimes narrowly so, 7–15 mm long, the hypanthium obconic to subcylindrical, 3–5(–7) mm long, the distal portion of bud subglobose to ovoid, 4–10 mm long; *indumentum pattern of buds* with all external surfaces glabrous or more commonly with peduncles, bracteoles, hypanthium, and calyx densely to moderately covered with spreading hairs, the petals glabrous, ciliate, or sparsely pubescence, the style glabrous or nearly so, the disk usually pubescent; *peduncles* 1–3-florous, 0.5–4 cm long, 1–2 mm wide, usually clustered on leafless or bracteate terminal or lateral shoots, or borne in the axils of leaves, the lateral arms of the dichasia 5–14 mm long; *bracteoles* narrowly triangular, ca. 2 mm long, caducous before anthesis. CALYX open in bud, bowl-like, with lobes scarcely distinguishable as undulations along the margin, tearing between the lobes ca. 2 mm at anthesis, the lobes prior to anthesis up to ca. 1 mm long; *petals* suborbicular, obovate, or oblanceolate-elliptic, 10–22 mm long, subglabrous within and without or sparsely pubescent without; *disk* 5–9 mm across; *stamens* 150–240, 5–17 mm long; *anthers* 0.7–1 mm long, with a terminal gland and 1–4 smaller glands below; *style* 12–17 mm long, the stigma ca. 0.5 mm across; ovary 2–3-locular, often pubescent within; *ovules* 37–52 per locule, about 2-seriate on each lamella of the peltate placenta. FRUIT subglobose to pyriform, 1–3.5 cm long; *seeds* 29–45 in fruits seen, subtriangular to C-shaped, angular, 5–10 mm long. (Fig. 24.)

Representative specimen examined. **Sento Sé**, Lagoa de Sento Sé, 9.67°S, 41.3°W, 400 m, 15 Aug 1912 (fl), *Zehntner 232* (ASU0069273-photo, RB).

Phenology—Flowering from June to October; fruiting mainly in November and December.

Habitat and Distribution—Riparian habitats, sometimes forested at 100 to 500 m. Brazilian endemic from Pará and Piauí south to Mato Grosso and Minas Gerais.

Distinguishing Features—Leaves lanceolate, usually narrowly so, or narrowly elliptic (rarely ovate), often slightly falcate, (4.5–)5.4–16.5 cm long, 2.2–6.9 times as long as wide; calyx open in bud, bowl-like, with lobes scarcely distinguishable as undulations along the margin.

21. *Psidium rotundidiscum* Proença and Tuler, Phytotaxa 288(2):162. 2016. TYPE. BRAZIL. Bahia: Maracás, 15–22 km ao S de Maracás na antiga Rodovia para Jequié, 900 m, 27 Abr 1978(fr), *S.A. Mori, L.A.M. Silva, J.A. Kallunki and T.S. dos Santos 10049* (HOLOTYPE: RB; ISOTYPES: CAS! NY!).

Tree up to 5(–22) m high, densely reddish tomentulose on young growth, the older leaves, and twigs losing most hairs; *hairs* curly, reddish brown, grayish with age,

densely tangled together, up to ca. 0.3 mm long; *young twigs* densely tomentulose, some hairs persisting until the first bark falls, the first bark falling as scales, the older twigs with reddish brown scaly bark at first, the bark eventually becoming reddish gray and striate, with cracks. LEAVES oblanceolate to elliptic, 5–9 cm long, 1.5–3.5 cm wide, 2–4 times as long as wide; *apex* rounded to obtuse, sometimes emarginated; *base* cuneate to acuminate; *petiole* shallowly channeled, 7–12 mm long, 1.5–2 mm wide, densely tomentulose at first, glabrescent with age; *venation* obscure, apparently brochidodromous, the lateral veins up to ca. 12 pairs, leaving the midvein at an angle of ca. 45°, sometimes impressed slightly above, the marginal veins and tertiary veins not visible; *blades* stiffly coriaceous, densely glandular, drying reddish brown to gray-green, the margins revolute, sometimes strongly so. FLOWER BUDS ca. 8 mm long, pyriform, the hypanthium ca. 4 mm long, the distal portion of bud subglobose, ca. 4 mm long; *indumentum pattern of buds* with all external surfaces and calyx lobes within densely tomentulose; *peduncles* uniflorous, borne in the axils of leaves or at leafless node, 6–8 mm long, probably ca. 0.8 mm thick in flower, ca. 1.5 mm thick at midpoint at maturity, wider at base and apex; *bracteoles* not seen. CALYX closed in the flower bud, tearing in 5 more or less regular lobes, the lobes in fruit about hemiorbicular, 5–6 mm long and wide, the tears between lobed not penetrating the staminal ring; *petals* 4–5 mm long, 3.5–4 mm wide, ciliate; *stamens* 130–190; *anthers* ca. 1 mm long; *style* ca. 3.5 mm long, glabrous; *ovary* 2-locular, the ovules at least 20 per locule, uniseriate on a peltate placenta. FRUIT to ca. 2 cm in diam., globose; seeds 3–4, 6–9 mm long, with rounded and flat sides. (Fig. 25.)

Representative specimens examined. These paratypes, seen as images only: **Boa Nova**, Parque Nacional de Boa Nova, Setor Sudoeste, Rancho do Sacramento, Gurutunga, 14°21'07''S, 40°15'00''W, 925 m, 8 Jan 2013 (fl), *Aona* et al. *2005* (photo specimen at ASU); **Maracás**, margem da estrada entre Maracás e Planaltino, 13°23'19''S, 40°28'22''W, 938 m, 19 Oct 2014 (fr), *Faria* et al. *4160* (photo specimen at ASU).

Phenology—Flowering in January and April; fruiting in April and October.

Habitat and Distribution—Semideciduous forest ("mata de cipó"). Apparently endemic to Bahia.

Distinguishing Features—Young growth reddish brown tomentulose; leaves mainly oblanceolate with revolute margins; calyx closed; seeds few, ca. 8 mm long.

Psidium rotundidiscum is similar to *P. rufum,* especially because they share a dense indumentum of curly, reddish-brown hairs. *Psidium rufum* differs in having an open calyx and seeds that are 4–5 mm long.

22. *Psidium rufum* DC., Prodr. 3: 234. 1828. TYPE. Brazil. "campis montanis prov. Minarum." *Martius s.n.* (SYNTYPES: M-32382, a flowering specimen with annotation by de Candolle; an additional Martius specimen in fruit is M-32383, probably part of original material as de Candolle mentions fruits in protologue).

Psidium macrospermum O. Berg, in Mart., Fl. bras. 14(1): 392. 1857. TYPE. Brazil. "Serra dos Orgaos prov. Rio de Janeiro." *Beyrich s.n.* (SYNTYPE: B, lost) *and* "ad S. Rey." *Sellow s.n.* (SYNTYPE: B, lost. ISOSYNTYPES: K-170089, P-258425!).

Psidium cupreum O. Berg, in Mart., Fl. bras. 14(1): 393. 1857. TYPE. Brazil. "in prov. Rio de Janeiro." *Sellow 223!* (HOLOTYPE: B, lost. ISOTYPES: BR-848969!, F-65692!, K-170091, LE-6974, P00258471!, W-46103!).

Psidium aerugineum O. Berg, in Mart., Fl. bras. 14(1): 391. 1857. Type. Brazil. "in campis prov. Rio Grande do Sul," *Sellow s.n.* (HOLOTYPE: B, lost; ISOTYPE LE-6972).

Psidium aerugineum var. ***angustifolium*** O. Berg, in Mart., Fl. bras. 14(1): 601. 1859. Type. Brazil (HOLOTYPE: LE; possibly based on same LE-6972 cited above).

Guajava macrosperma (O. Berg) Kuntze, Rev. Gen. 239. 1891.

Guajava cuprea (O. Berg) Kuntze, Rev. Gen. 239. 1891.

Guajava aeruginea (O. Berg) Kuntze, Rev. Gen. 239. 1891.

Psidium rufum var. ***rotundifolia*** Kiaerskou, Enum. Myrt. bras. 31. 1893. TYPE. Brazil. "Lagoa Santa," *Warming s.n.* (HOLOTYPE: C-10015965).

Psidium lagoense Kiaerskou, Enum. Myrt. bras. 30, tab. 3, fig. f. 1893. TYPE. Brazil. "Ad Lagoa Santa in sivulis [*Warming 1*] et in silvis in monte da Serra da Piedade [*Warming 112*]," both mounted on a single sheet. *Warming 1* (SYNTYPE: C-10015958) and *Warming 112* (SYNTYPE: C-10015961).

Psidium cupreum var. ***glabratum*** Kiaerskou, Enum. Myrt. bras. 29. 1893. TYPE. Brazil. "Rio de Janeiro," *Glaziou 16989* (HOLOTYPE: C-10015951. ISOTYPES: BR-526987!, K-170090).

Psidium araca var. ***sampaionis*** Herter, Arq. Mus. Nac. Rio de Janeiro 18: 12, 26. 1916. TYPE. Brazil. (possible HOLOTYPE. R [=ASU photo]).

Tree or shrub 0.4–8 m high, moderately to densely pubescent on young growth; *hairs* curly, more or less erect or less often appressed, up to ca. 1 mm long, usually reddish brown (less often whitish or yellowish); *young twigs* densely pubescent, reddish brown, the hairs persisting until the first bark falls, the older bark grayish to reddish brown, rough or smooth. LEAVES elliptic, oblong-elliptic, narrowly elliptic, obovate, or oblanceolate, 5–12 cm long, 1.3–5.5 cm wide, 1.6–3.8(–5.2) times as long as wide; *apex* rounded, acute, or acuminate; *base* acute, acuminate, or cuneate; *petiole* shallowly channeled, (2–)3–9 mm long, 1–2 mm wide, moderately to densely pubescent; *venation* brochidodromous, the midvein impressed above, prominent below, the lateral veins straight, 7–12 pairs, prominent below, often impressed above, leaving the midvein at an angle of ca. 45°, the marginal veins arching somewhat between laterals, usually running within 1–4(–5) mm of the margin, a second weak marginal vein near the margin sometimes evident, the tertiary veins impressed or not above, forming an irregular or regular dendritic pattern that alternates with laterals, if regular appearing to arise from the marginal vein; *blades* stiffly coriaceous at maturity, often bullate or with the appearance of old leather because of impressed veins, drying gray-green to reddish brown. FLOWER BUDS 6–12 mm long, pyriform, the hypanthium obconic, 2–4 mm long, the distal portion of bud subglobose, sometimes wider than long, 4–8 mm long; *indumentum pattern of buds* with all external surfaces densely covered with spreading or appressed hairs, or the calyx less densely covered, the petals pubescent to subglabrous without, sometimes ciliate, glabrous or nearly so within, the disk with the staminal ring densely to sparsely pubescent, the style glabrous or less often basally pubescent; *peduncles* 2–14 mm long, 0.5–1 mm wide, solitary in the axils of leaves or bracts or at leafless nodes; *bracteoles* linear (2–)4–12 mm long, up to 1 mm wide. CALYX open in bud, bowl-like, the lobes broadly rounded, scarcely prolonged beyond rim, 0.5–2 mm long (rarely triangular and up to 6 mm long), the tubular portion of calyx tearing between the lobes at anthesis, the tears not penetrating the staminal ring; *petals* 6–8 mm long; *disk* 4–5 mm across; *stamens* 160–280, 5–10 mm long; *anthers* 0.5–1 mm long, with a terminal gland and up to 4 smaller glands below; *style* 4–7 mm long; *ovary* 3-locular, the locules pubescent within; *ovules* 9–27 per locule, 1–2-seriate on each lamina, the placenta usually slightly peltate. FRUIT globose, up to 2 cm across; *seeds* 4–23, 4–5 mm long. (Fig. 26.)

Representative specimens examined. Abaíra, um pouco abaixo de Tanquinho, Bem Querer, 13.25°S, 41.9°W, 1450 m, 14 Nov 1992 (fr), *Ganev 1442* (ASU0018706, HUEFS); **Mucugê**, 12.3167°S, 41.6167°W, 18 Oct 1986 (fr), *Assis et al. 420* (CEPEC); **Palmeiras**, Cercado, 12.567°S, 41.3833°W, 6 Apr 2004 (fr), *van den Berg et al. 1386* (HUEFS); **Piatã**, Serra do Atalho, proximo ao caminho Velho de Inúbia-Cravada, 13.1167°S, 41.9167°W, 1420 m, 20 Aug 1992 (fr), *Ganev 909* (HUEFS); **Rio de Contas**, Pico das Almas, Campo do Queiroz, 13.53°S, 41.95°W, 3 Nov 1988 (fl), *Harley 25891* (ASU0008271).

Phenology—Flowering mainly in October and November; fruiting throughout year.

Habitat and Distribution—Forests and campos at elevations of 870–1700 m. Brazilian endemic from Bahia to Paraná.

Distinguishing Features—Flower buds densely covered with usually reddish brown hairs; calyx bowl-like, open, usually with evident lobes; leaf blades stiffly coriaceous at maturity, often bullate or with the appearance of old leather because of impressed veins.

Psidium rufum is sometimes confused with *P. laruotteanum*. They are directly contrasted in couplet 11 of the key.

23. *Psidium salutare* (H.B.K.) O. Berg, Linnaea 27: 356. 1856.

Myrtus salutaris H.B.K., Nov. gen. sp. 6: 132. 1823. TYPE. Venezuela. "Carichanam, ad ripam Orinoci", *Humboldt and Bonpland s.n.* (HOLOTYPE: P-679449. ISOTYPE: B [=B1263/11 photo at MICH]).

Subshrub or shrub up to ca. 1.5 m high (often less than 0.5 m high), with new shoots arising from a woody subterranean base or rhizome, with shoots often short lived, or in *Psidium salutare* var. *pohlianum* sometimes reaching tree size (up to 10 m high), glabrous, glabrous except for disk and calyx lobes within, or sparsely to moderately pubescent on young growth, or silvery lanate in one variety; *hairs* when present whitish, 0.3–1 mm long; *young twigs* glabrous to densely pubescent, reddish brown, becoming grayish, the older bark gray to reddish brown, becoming flaky. LEAVES opposite or alternate on some shoots (rarely ternate), ovate, lanceolate, elliptic, narrowly elliptic, obovate, oblanceolate, (1–)2–9 cm long, 0.6–5.5 cm wide, 1.4–5 times as long as wide, drying gray green to reddish brown, the margin entire to somewhat revolute; *apex* obtuse, acute to acuminate, abruptly acuminate, sometimes apiculate; *base* cuneate, obtuse, or rounded; *petiole* 0–2(–3) mm long, 1–1.5(–2) mm wide; *venation* brochidodromous, the midvein normally flat or slightly raised above, prominent below, the lateral veins 5–12 pairs, prominent to scarcely visible, leaving the midvein at an angle of ca. 45° or less, nearly straight, the marginal veins arching shallowly between laterals, equaling laterals in prominence, running 0.2–2 mm from the margin, the tertiary veins forming a dendritic pattern between the laterals, sometimes appearing to arise from the marginal vein or the midvein; *blades* stiffly coriaceous at maturity, drying reddish brown to gray-green, dull or lustrous above, the cellular pattern sometimes visible with a dissecting scope. FLOWER BUDS pyriform, 4–7 mm long, the hypanthium obconic to campanulate, 1–3 mm long, the distal portion subglobose, wider than long, 2.5–4.5 mm long; *indumentum pattern of buds* with all surfaces glabrous, glabrous except for disk and calyx lobes within, or sparsely to

moderately pubescent or silvery lanate except for glabrous petals, disk, and style; *peduncles* axillary, uniflorous or triflorous, 0.4–3.5 cm long, 0.5–0.8 mm wide; *bracteoles* linear to lanceolate, deciduous or persisting, 2–9 mm long, 0.5–2 mm wide. CALYX open, bowl-like, tearing ca. 1 mm between the lobes at anthesis, the lobes broadly rounded to ovate-triangular, 0.5–5(–6) mm long, 2–3(–4) mm wide; *petals* obovate to suborbicular, 5–11 mm long; *disk* 3–4(–5) mm across; *stamens* 100–200, 5–12 mm long; *anthers* subglobose to oblong, 0.3–0.8 mm long, with 1–3 glands; *style* 5–8 mm long; *ovary* 2–3-locular; *ovules* 9–48 per locule, uniseriate or biseriate along edge of the placenta, this strongly to scarcely peltate. FRUIT globose to subglobose, 8–10 mm in diam.; *seeds* 4–20, 4–8 mm long, subovoid. (Fig. 27.)

This description is for *Psidium salutare* in general, a species of five varieties (Landrum 2003). As far as is known, only *P. salutare* var. *pohlianum* is found in Bahia.

Psidium salutare var. ***pohlianum*** (O. Berg) Landrum, Sida 20(4): 1466. 2003.

Psidium pohlianum O. Berg, in Mart., Fl. bras. 14(1): 390. 1857. Type. Brazil. "v. fructif. in hb. Vindob., sine fruct. et florib. in hb. Berol." "ad S. Luzia in prov. Goyazensi," *Pohl 913* (SYNTYPE: W-48043. ISOSYNTYPE: F-65713!) and *Sellow s.n.* (SYNTYPES: B, lost, W-48042. ISOSYNTYPE: K-170088, P-258394!, P-258394!). [An Isosyntype at P was erroneously designated as a lectotype by Landrum (2003)].

Psidium pohlianum var. ***brevipes*** O. Berg, in Mart., Fl. bras. 14(1): 601. 1859. TYPE. Brazil. "prope S. Carlos prov. S. Pauli," *Riedel s.n.* (apparent HOLOTYPE LE-6998 [mixed with other collections]).

Shrub or tree to 10 m high, the trunk bark rough, deeply cracked; leaves mostly elliptic, to obovate, or oblanceolate, 4–9 cm long, 2–5.5 cm wide, 1.4–2.7(–3.5) times as long as wide, glabrous; venation pronounced, raised on both surfaces, the marginal vein usually about 1 mm from the margin; apex usually without an apiculum; peduncle 0.4–2 cm long, often triflorous; calyx lobes shorter or about as long as the calyx tube, rounded to obtuse.

Representative specimens examined. Abaíra, Frios, caminho Guarda Mor-Frios pelo covuão, Divisão Bacia Rio de Contas e Bacia do São Francisco, 13.333°S, 41.883°W, 1600–1700 m, 11 Abr 1994 (fr), *Ganev 3085* (HUEFS); **Caetité**, 6 km ao Sul de Caetité na estrada para Brejinho das Ametistas, 14.129722°S, 42.504167°W, 10 Jan 2006 (yfr), *Nunes et al. 1556* (ASU0057417); **Correntina**, Fazenda Jatobá, 13.233°S, 44.75°W, 9 Jan 1991 (fr), *Rezende et al. 137* (UB); **Licínio de Almeida,** 14.662083°S, 42.547806°W, 954 m, 25 Feb 2012 (fr), *Roque et al. 3363* (ASU0075034-photos); **Mucugê**, 12.31667°S, 41.6167°W, 18 Oct 1986 (fr), *Santino de Assis et al. 420* (RB); **Palmeiras,** Palmeiras, 12.5667°S, 41.3833°W, 6 Apr 2004 (fr), *van den Berg et al. 1386* (ASU0015581); **Rio de Contas**, Serra do Rio de Contas, near Junco, ca. 15 km NW of the town of Rio de Contas, 13.53°S, 41.9167°W, 1200 m, 22 Jan 1974 (fr), *Harley 15596* (ASU0015546, CEPEC).

Phenology—Flowering mainly from September to December; fruiting mainly from January to March.

Habitat and Distribution—Cerrado, campo rupestre, areas subject to burning at 1000 to 1600 m. The species *Psidium salutare* is found from Mexico to Uruguay; *P. salutare* var. *pohlianum* is found from São Paulo to Ceará and Mato Grosso in Brazil and also in Bolivia and Venezuela.

Distinguishing Features—*Psidium salutare* is distinguished by relatively small flower buds (less than 1 cm long); an open calyx, usually with well-defined lobes; brochidodromous venation with a well-marked marginal vein that closely follows the

margin; peltate placenta; and an ability to sprout back after fires. Of the five varieties recognized (Landrum 2003), only *P. salutare* var. *pohlianum* is found in Bahia. It is distinguished from other varieties by is larger size (to 10 m) and larger leaves (to 9 cm long). It is distinguished from most other Myrtaceae by it rough, deeply crack trunk bark.

24. *Psidium schenckianum* Kiaerskou, Enum. Myrt. bras. 34, tab. 13, fig. f. 1893. TYPE. Brazil. "Garanhuus [Garanhuns] Prov. Pernambuco," *Schenck 4174* (SYNTYPE: C-10015968) and *Schenck 4239* (SYNTYPE: C-10015967).

Shrub up to 2(–3) m high, sparsely to moderately puberulent on young growth; *hairs* simple, whitish to yellowish, minute, up to ca. 0.2 mm long, mainly erect; *young twigs* yellowish brown to reddish brown, moderately to densely puberulent, in age becoming gray, the surface then nearly smooth or with a minute reticulate scaly pattern, the indumentum persisting until the first bark falls. LEAVES suborbicular to oblong-elliptic, subsessile, 1–3(–5) cm long, 0.8–2.4 cm wide, 1–1.7(–2) times as long as wide, glabrous to sparsely puberulent, the margin revolute; *apex* acute, obtuse, or emarginate; *base* rounded to cordate; *petiole* unchanneled, up to ca. 1 mm long and thick, glabrous to puberulent; *venation* obscure or not, brochidodromous, the midvein about flat or slightly raised above, often prominent below, the lateral veins if visible, ca. 4 pairs, leaving the midvein at an angle of ca. 45°, the marginal vein broadly arching between the laterals, the tertiary veins not clearly visible; *blades* thickly coriaceous, drying dark olive-green above, light reddish brown below, often with light gray mottling above, densely glandular. FLOWER BUDS pyriform, 4–6 mm long, the hypanthium obconic to campanulate, 1.5–2 mm long, the distal portion of bud subglobose (not including the calyx flanges), 2.5–4 mm long; *indumentum pattern of buds* with peduncles, bracteoles, and hypanthium glabrous to puberulent, the calyx glabrous to sparsely puberulent without, densely puberulent within, the petals densely puberulent without and glabrous within, the disk puberulent, the style glabrous; *peduncles* 8–15 mm long, 0.3–0.5 mm wide, solitary, uniflorous; *bracteoles* linear-filiform, 1.5–5 mm long, 0.1–0.2 mm wide, recurved when dry, deciduous at about anthesis. CALYX bowl-like, encircling the closed corolla at its widest point, the lobes with two distinct parts, a clasping base that is connate along its edges with adjacent lobes (forming the bowl), and a flange-like subapical appendage, the bowl 1.7–3 mm long, tearing between the lobes into subrectangular pieces, these 1–2 mm long and wide, the tears not usually cutting into the staminal ring, the flange-like appendages about hemiorbicular, radiating, laterally compressed, 1.5–2 mm long; *petals* suborbicular, 3–4 mm long; *disk* ca. 3 mm across; *stamens* 90–130, 4–6 mm long; *anthers* 0.3 mm long, with a single terminal gland; *style* 4–6 mm long; *ovary* 2–3-locular; *ovules* 7–11 per locule. FRUIT globose, 7–20(–30) mm in diameter, crowned by the persistent calyx lobes, the wall 1–1.5 mm thick; *seeds* 4–13, 3.5–5.5 mm long, with rounded and flat sides. (Fig. 28.)

Representative specimens examined. Abaíra, Brejo do Engenho, 13.3°S, 41.8°W, 1000 m, 30 Mar 1992 (fr), *Nic Lughadha et al. 53358* (HUEFS, SPF, K, CEPEC); **Alagoinhas**, Campus II/ UNEB, 12.13°S, 38.43°W, 120–150 m, 13 Oct 1999 (fl and fr), *Jesus et al. 297* (HUEFS); **Andorinha**, estrada para o Sítio do acude, 10.2122°S, 39.9128°W, 430–470 m, 18 Feb 2006 (yfr), *França et al. 5459* (ASU0014349); **Caetité**, ca. 14 km ao norte de Caetité em direção a Maniaçu, estrada de terra à esquerda da estrada principal, 13.9342°S, 42.4711°W, 894 m, 12 Apr 2005 (fr), *Miranda 760* (ASU0015714); **Castro Alves**, Tabuleiro do Salgado, 12.75°S, 39.433°W, 17 Jan 1957 (fr), *Lordeio 57–14* (ALCB,

HRB); **Compo Formoso**, 10.5089°S, 40.4331°W, 739 m, 13 Apr 2006 (fl), *Melo and Silva 228* (ASU0014352); **Coração de Maria**, estrada para Retiro, ca. 10 km de Feira de Santana, 12.23°S, 38.75°W, 235 m, 22 Sep 1995 (fl, yfr), *França et al. 1347* (ASU0014368); **Feira de Santana**, Campus da UEFS, 12.25°S, 38.967°W, 12 Feb 1984 (fr), *Noblick 2931* (HUEFS, HRB); **Gloria**, Aldeia Serrota, 9.3°S, 38.4833°W, 6 Jan 2006 (fl), *Colaço 87* (ASU0014350); **Iaçu**, Faz. Suibra (Boa Sorte), 18 km a E da cidade, seguindo à ferrovia, 13 Mar 1985 (fr), *Noblick 3630* (HUEFS); **Iraquara**, Serra da Agua de Rega, ca. 1 km N of Agua de Rega, road to Carfarnaum, 1000 m, 28 Feb 1971, (MICH, MO, NY, R); **Jacobina**, Serra do Cruzeiro, 11.207°S, 40.481944°W, 1040 m, 7 Apr 2001, *Ribeiro et al. 179* (HUEFS); **Jequié**, caminho da Barragem, 13.8233°S, 40.317222°W, 580 m, 19 Feb 2011, *Macedo 2177* (NY); **Maracás**, 1 km NE de Maracás, 13.433°S, 40.45°W, 2 Jul 1993 (fl), *Queiroz and Fraga 3297* (HUEFS); **Miguel Calmon**, entre a Fazenda Pé de Serra e o riacho do Caldeirão, 11.4075°S, 40.554444°W, 820 m, 5 Apr 2001 (fl, fr), *Ribeiro et al. 123* (HUEFS); **Morro do Chapéu**, Rio Ferro Doido, 11.6167°S, 40.9908°W, 730 m, 15 Nov 1999 (fr), *Melo et al. 3076* (ASU0015713); entre **Nova Soure** e **Buritinga**, 11.448714°S, 38.654316°W, 25 May 1983 (fr), *Bautista and Pinto 742* (ASU0015766-photo, HRB); **Palmeiras**, caminho para Conceição dos Gados, 12.533056°S, 41.553056°W, 21 Mar 2003 (fr), *Melo et al. 3534* (HUEFS); **Ruy Barbosa**, subida para a serra do Orobo, no começo da subida, proximo à cidade, 12.303056°S, 40.487°W, 547 m, 12 Apr 2012 (fl), *Faria 2621* (ASU0078793); **Santa Teresinha**, Riacho Grande, ca. 5 km al NE de Itatim, 12.75°S, 39.53°W, 16 May 1984 (fl), *Noblick et al. 3249* (ALCB, HUEFS); **Tucano**, povoado da Pedra Grande, Serra do Pai Miguel, 11.1233°S, 38.773611°W, 224 m, 4 Jan 2006 (fl), *Cardoso and Amadeu 900* (ASU0057593); **Uauá,** Serra do Jeronimo, 9.723056°S, 39.3322°W, 30 Mar 2000 (fl), *Alves et al. 2* (HUEFS).

Phenology—Flowering mainly from September to December; fruiting mainly from January to April.

Habitat and Distribution—Caatinga, cerrado, at 120–1040 m; Brazilian endemic, known to me only from Bahia and Pernambuco, but reported to grow from Paraiba to Minas Gerais by SpeciesLink (2017).

Distinguishing Features—Calyx bowl-like, the lobes with two distinct parts, a clasping base that is connate along its edges with adjacent lobes (forming the bowl), and a flange-like subapical appendage, the flange-like appendages about hemiorbicular, radiating, laterally compressed; leaves suborbicular to oblong-elliptic, subsessile; venation often obscure.

Psidium schenckianum is hypothesized to hybridize with *P. appendiculatum* and *P. oligospermum* (discussed under those species). It also hybridizes with *P. brownianum*; a key comparing the two species is provided below.

1. Calyx without flange-like subapical appendages; lateral veins 7–13 pairs; leaves ovate, lanceolate to lanceolate-oblong, 3–12 cm long, 2–6 cm wide; petiole 0–4(–5) mm long; bracteole narrowly triangular, 0.5–2 mm long; peduncles often on bracteates shoots or otherwise clustered together..... ***P. brownianum***

1' Calyx with flange-like subapical appendages; lateral veins ca. 4 pairs if visible; leaves suborbicular to oblong-elliptic, subsessile, 1–3(–5) cm long, 0.8–2.4 cm wide; petiole 0–1 mm long; bracteole linear-filiform, 1.5–5 mm long; peduncles solitary..... ***P. schenckianum***

The specimen I suspect of being a hybrid is *Harley 19333* (ASU0015704) from Morro do Chapéu. The leaves are smaller than most *P. brownianum* but the ovate shape is typical of that species; lateral veins are up to about 7 pairs (about intermediate between the two species); there is a hint of a flange on some calyx lobes; inflorescences appear more typical of *P. schenckianum*.

25. *Psidium striatulum* DC., Prodr. 3: 233. 1828. TYPE. Brazil. *Martius s.n.* (HOLOTYPE: M-32386, annotated by de Candolle).

Psidium turbiniflorum DC., Prodr. 3: 234. 1828. TYPE. Brazil. "in Brasilia." *Martius s.n.* (HOLOTYPE: M-32388, annotated by de Candolle. Possible ISOTYPES: from Ega on Rio Negro, M-32387, M-146858!).

Psidium aquaticum Bentham in Hook. J. bot. 2: 318. 1840. TYPE. British Guiana. *Schomburgk 191* (HOLOTYPE: K-565506. ISOTYPES: BM-796830, BR-5281459!, E-167679, F-76381!, F-76382!, MICH-1210416, P-2428283, US-117654, W-46098!).

Psidium parviflorum Bentham, J. Bot. (Hook.) 2: 318. 1840. TYPE. British Guiana. "on the Essequibo and Rupunoony." *Schomburgk 110* (SYTYPES: K-565174 [annotated isotype], K-565402. ISOSYNTYPES: BM-796861, E-167680, F-65709, P-258400!, P-258401!, TCD-4963, US-117671, W-48041).

Psidium aquaticum var. ***uniflorum*** O. Berg, Linnaea 27: 354. 1856. Name to be replaced by the autonym *Psidium aquaticum* var. *aquaticum* because Berg cites *P. aquaticum* under that variety.

Psidium aquaticum var. ***triflorum*** O. Berg, Linnaea 27: 355. 1856. TYPE. British Guiana. *Rich. Schomberg 539* (HOLOTYPE: B, lost).

Psidium leptocladum O. Berg, in Mart., Fl. bras. 14(1): 409. 1857. TYPE. Brazil. "ad flumen Rio Maranhao in prov. Goyazensi." *Pohl 1018* (SYNTYPES: W-16678, W-16679).

Psidium persicifolium O. Berg, in Mart., Fl. bras. 14(1): 407. 1857. TYPE. Brazil. "in montibus Serra d'Acurua prov. Bahiensis, [11.5S, 42.5W]" "v. in hb. Berol., Mart., Vindob." *Blanchet 2916* (SYNTYPES: BR-528154!, W-16676, W-18890124691. ISOSYNTYPES: BM-796800, E-167674, F-65711, G-227672!, HAL-89787, K-18468, LE-6997, MICH-1210427!, P-258398!, P-258397!, P-258399!).

Guajava [s]triatula (DC.) Kuntze, Rev. Gen. 239. 1891.

Guajava parviflora (Benth.) Kuntze, Rev. Gen. 240. 1891.

Guajava persicifolia (O. Berg) Kuntze, Rev. Gen. 239. 1891.

Guajava turbiniflora (DC.) Kuntze, Rev. Gen. 239. 1891.

Myrtus striatula (DC.) O. Kuntze, Rev. Gen 3(2): 92. 1898.

Psidium parviflorum var. ***saramaccense*** Amshoff, Bull. Torr. Bot. Club 75: 537. 1948. TYPE. Surinam. "Saramacca River." *Maguire 24930* (HOLOTYPE: NY-1288075!. ISOTYPES: F-76391!, K-565403, U-5190, US-117672).

Psidium parviflorum var. ***coppenamense*** Amshoff, Fl. Suriname 3, pt. 2: 153. 1951. TYPE. Surinam. "Coppename R." *Boon 1083* (SYNTYPE: U?), "Raleighfalls" *Stahel 4654* (SYNTYPE: U?) and "Raleighfalls" *Lanjouw 997* (SYNTYPES: U-5188, U-5189; ISOSYNTYPES: K-565418, NY-1288072!).

Shrub or small tree 1–6 m high; *hairs* 0.1–0.6 mm long, on external surfaces soft, whitish, usually spreading to erect, densely to sparsely covering young growth, the hairs on inner surfaces of calyx and disk reddish brown, appressed; *young twigs* moderately to densely covered with spreading hairs or rarely glabrous, soon glabrescent, the young bark reddish brown to light gray, becoming dark reddish brown or dark gray, remaining smooth or becoming longitudinally striate or cracked or slightly flaky in age. LEAVES elliptic, ovate, or oblong-lanceolate, usually widest at the middle or below, 2.2–7(–12) cm long, 1.5–3(–5) cm wide, 1.5–3 times as long as wide, glabrous or with scattered hairs, or sparsely to densely pubescent along the midvein, the margin usually obscurely sinuate-crenulate; *apex* acute, acuminate, less often rounded-obtuse (rarely emarginate), often apiculate; *base* rounded, subcordate, or obtuse; *petiole* pubescent or glabrous, channeled, 1–3 mm long, 0.8–1.5 mm thick; *venation* brochidodromous, sometimes eucamptodromous proximally, the midvein impressed above, prominent below, the lateral veins 4–10 pairs, leaving the midvein at an angle of 45° to nearly 90°, the marginal vein broadly arching between the laterals,

as much as 7 mm from margin between arches, the tertiary veins obscure or pronounced, irregularly dendritic; *blades* submembranous to subcoriaceous, drying gray-green to dark reddish brown, slightly lighter below than above, lustrous to dull above, usually densely dotted with glands. FLOWER BUDS 8–14 mm long, pyriform, the hypanthium campanulate, narrowly campanulate or fusiform, 3–5 mm long, the distal portion of bud subglobose to barrel-shaped, sometimes wider than long, 5–9.5 mm long; *indumentum pattern of buds* with peduncles moderately to thinly pubescent with spreading hairs, or glabrous, the bracteoles pubescent, the hypanthium pubescent to glabrous, the calyx puberulent within, pubescent to glabrous without, the petals glabrous or ciliate, the disk puberulent, the style glabrous; *peduncles* uniflorous (rarely 3-flowered), solitary, borne in the axils of leaves, usually terete, 0.9–2.3 cm long, 0.8–1 mm wide, thicker and somewhat woody at fruit maturation, usually puberulent with erect hairs; *bracteoles* narrowly triangular to filiform, ca. 1–2 mm long, caducous before bud matures. CALYX bowl-like, closed except for an apical pore, or completely closed, with no clear lobes evident before anthesis, extending 3–6(–8) mm beyond the ovary summit, densely glandular, at anthesis tearing somewhat irregularly or in 5 nearly equal lobes, the tears not cutting the staminal ring; *petals* obovate, 10–12 mm long; *hypanthium* densely glandular; *disk* ca. 4–5 mm across; *stamens* ca. 200–300, 8–15 mm long; *anthers* ca. 0.7–2 mm long, with a terminal gland and 0–2 smaller glands below; *style* 10–14 mm long, the stigma peltate, 0.5–1 mm wide; *ovary* 3-locular, the placenta not peltate; *ovules* ca. 30–60 per locule, about 4-seriate. FRUIT globose, 1–1.5 cm long, brown to green, sometimes tinted red [at maturity?]; *seeds* ca. 80 in 1 fruit, probably often more, compressed, angular, C to L-shaped, ca. 4–5 mm long. (Fig. 29.)

Representative specimen examined. Barra, estrada Barra-Ibotirama. BA-161, ponte sobre o Rio Grande, 11.1564°S, 43.3694°W, 385m, 2 Jun 1999 (fr), *Melo et al. 2715* (ASU0015710).

Phenology—Flowering and fruiting throughout year.

Habitat and Distribution—Along rivers or on islands in rivers, mainly in rocky places; reported also from a white sand savanna. Found from Roraima to Mato Grosso do Sul in Brazil; also in Bolivia, Venezuela and the Guianas.

Common names—araçá (Brazil); water guava, awataka (Guyana); liba-goejaba (Surinam).

Distinguishing Features—Calyx bowl-like, closed except for an apical pore, or completely closed, with no clear lobes evident before anthesis, extending 3–6(–8) mm beyond the ovary summit, at anthesis tearing somewhat irregularly or in 5 nearly equal lobes, the tears not cutting the staminal ring; peduncle usually terete, 0.8–1 mm wide, thicker and somewhat woody at fruit maturation, usually puberulent with erect hairs; seeds angular.

26. *Psidium sp. A*

Probably a shrub, puberulent on young twigs and disk, sparsely puberulent to glabrous otherwise; *hairs* less than 0.1 mm long, erect whitish; *young twigs* yellowish brown, puberulent, more or less terete between nodes, compressed at nodes and protruding around the attachment of the leaves, ca. 2 mm wide at nodes, the leaves and protrusions decussate, the older twigs gray, the bark slightly rough with cracks, the axillary buds prominent, short conical, ca. 0.5 mm long, covered by two reddish brown

scales. LEAVES linear to narrowly oblanceolate, 1–1.5 cm long, 2–3 mm wide, ca. 7–9 times as long as wide, the margin revolute; *apex* obtuse, often ending in a small cusp; *base* acute to narrowly cuneate; *petiole* 1–1.5 mm long, ca. 0.5 mm wide, sparsely puberulent, unchanneled; venation probably brochidodromous, the midvein barely visible, the other veins not visible; *blades* coriaceous, densely glandular, the margin revolute. FLOWER BUD unknown; *peduncles* solitary, uniflorous, glabrous, to ca. 1.5 cm long, ca. 0.5 mm wide. CALYX apparently closed in bud and tearing irregularly; *disk* puberulent; *stamens* between 100 and 200 (estimated by scars). FRUIT globose, ca. 0.5 cm in diameter; *seeds* 1 or 2 per fruit, somewhat lustrous. (Fig. 30.)

Representative specimen examined. Tanque Novo, [13.55°S, 42.49°W], 28 Apr 1995 (fr), *Andrade and Cavada s.n.* (SPF).

Phenology—Fruiting in April.

Habitat—unknown.

Distinguishing Features—Small, sparsely puberulent to glabrous, narrow leaves, closed calyx.

27. *Psidium sp. B*

Tree or shrub to ca. 3.5 m high, the young growth thinly pubescent to tomentose, the lower leaf surfaces densely tomentose; *hairs* yellowish brown, curled, tangled, up to ca. 0.5 mm long; *young twigs* light yellowish tan, with numerous darker glands, usually thinly pubescent, the hairs persisting until the first bark falls, the older twigs smooth or with cracks, silvery gray to yellowish brown, with prominent dormant buds in the axils of the leaves, these ca. 1–1.5 mm long, dark, with imbricate scales. LEAVES elliptic to obovate, 3–6.5 cm long, 2–3.5 cm wide, 1.1–2.2 times as long as wide, densely tomentose below, the upper surface glabrous to sparsely puberulent or densely so on the midvein; *apex* obtuse to acute, often with a cuspidate tip, when pressed sometimes appearing emarginated; *base* acuminate to cuneate; *petiole* 4–5 mm long, 1–1.5 mm wide, thinly pubescent, unchanneled, the leaf blade often narrowly decurrent along the petiole; *venation* brochidodromous distally, eucamptodromous proximally, prominent in mature leaves, the midvein prominent below, flat above, the lateral veins 4–6 pairs, arching toward apex, leaving the midvein at an angle of 30–60°, the marginal vein connecting the laterals in wide arcs, running between 1–5 mm from the margin, a weaker marginal vein sometimes evident between the main marginal vein and the margin, the tertiary veins forming a complex reticulate pattern between the laterals, sometimes nearly as strong as the laterals; *blades* subcoriaceous at maturity, the margin somewhat sinuate. FLOWER BUDS unknown; *indumentum pattern of buds* with all external surfaces apparently tomentose, the inner surface of calyx moderately pubescent to glabrous; *peduncles* 1–5 mm long, ca. 1 mm wide. CALYX probably closed or nearly so in the bud, tearing irregularly. FRUIT subglobose, 5–10 mm long; seeds up to ca. 4 per fruit, ca. 3 mm long, the seed coat with several layers of dense cells. (Fig. 31.)

Representative specimens examined. Anagé, distrito Coquinho, Fazenda Curral Novo, 14° 27'S, 40°52W, 710 m, 2 Apr 1984 (yfr), *Oliveira and Lima 145* (CEPEC, HRB, RB).

Habitat—Caatinga.

Phenology—Immature fruits in April.
Common name—Araçazinho.
Distinguishing Features—Relatively small, yellowish brown tomentose leaves with 4–6 pairs of lateral veins; calyx probably closed and tearing irregularly; seeds few.

This species is known from specimens of one gathering cited above. In some respects it is similar to *P. rhombeum* but differs in tomentose external floral structures and lower leaf surface. It appears that the calyx may be closed in the bud of this species while it is open in *P. rhombeum*. It is also separated geographically from known populations of *P. rhombeum* by ca. 500 km.

28. *Psidium sp. C*

Shrub, the young growth thinly to moderately strigose, or hirsutulose on inner flower surfaces or insect galls; *hairs* clear, white, or light yellowish, to ca. 1 mm long; *young twigs* yellowish brown, sparsely strigose, moderately glandular, the older twigs grayish, the bark smooth to longitudinally cracking, with vegetative buds present in some leaf axils, these apparently producing cataphylls as they open, the expanded cataphylls oblong, up to 7 mm long and 4 mm wide. LEAVES obovate to oblanceolate, 2.2–5.8 cm 1ong, 1–2.7 cm wide, 1.8–2.9 times as long as wide; *apex* acute to abruptly acuminate; *base* cuneate; *petiole* 0.5–2 mm long, ca. 1 mm wide, slightly channeled, with a spur-like protuberance ca. 0.5 mm long at base so that the petiole attachment appears to be above the base; *venation* brochidodromous distally, eucamptodromous proximally, the midvein scarcely visible and flat above, moderately prominent below, the lateral veins 6–7 pairs, leaving at an angle of ca. 45° or less, arching towards apex near the margin, the marginal vein weak, only present distally, running 1–4 mm from the margin, the tertiary and smaller veins forming a reticulate pattern between the laterals; *blades* membranous to submembranous at anthesis. FLOWER BUDS pyriform, 5–6 mm long, the hypanthium obconic, ca. 2.5 mm long, the distal portion not seen in bud; *indumentum pattern* of buds with external surfaces sparsely strigose, the inner surfaces densely hirsutulose except for subglabrous disk within, staminal ring, and distal portion of style; *peduncles* uniflorous, 5–7 mm long, ca. 0.5 mm wide, borne in axils of leaves or at leafless nodes. CALYX closed in bud, with a rostrate tip ca 1.2 mm long, falling as a calyptra; *petals* unknown; *disk* within staminal ring ca. 2 mm across; stamens and anthers unknown; *style* 3–4 mm long, with a swollen, hirsutulose base; ovary 2-locular, the placenta central, peltate; *ovules* 7–10 per locule, reflexed; *fruit* and *seeds* unknown. (Fig. 32.)

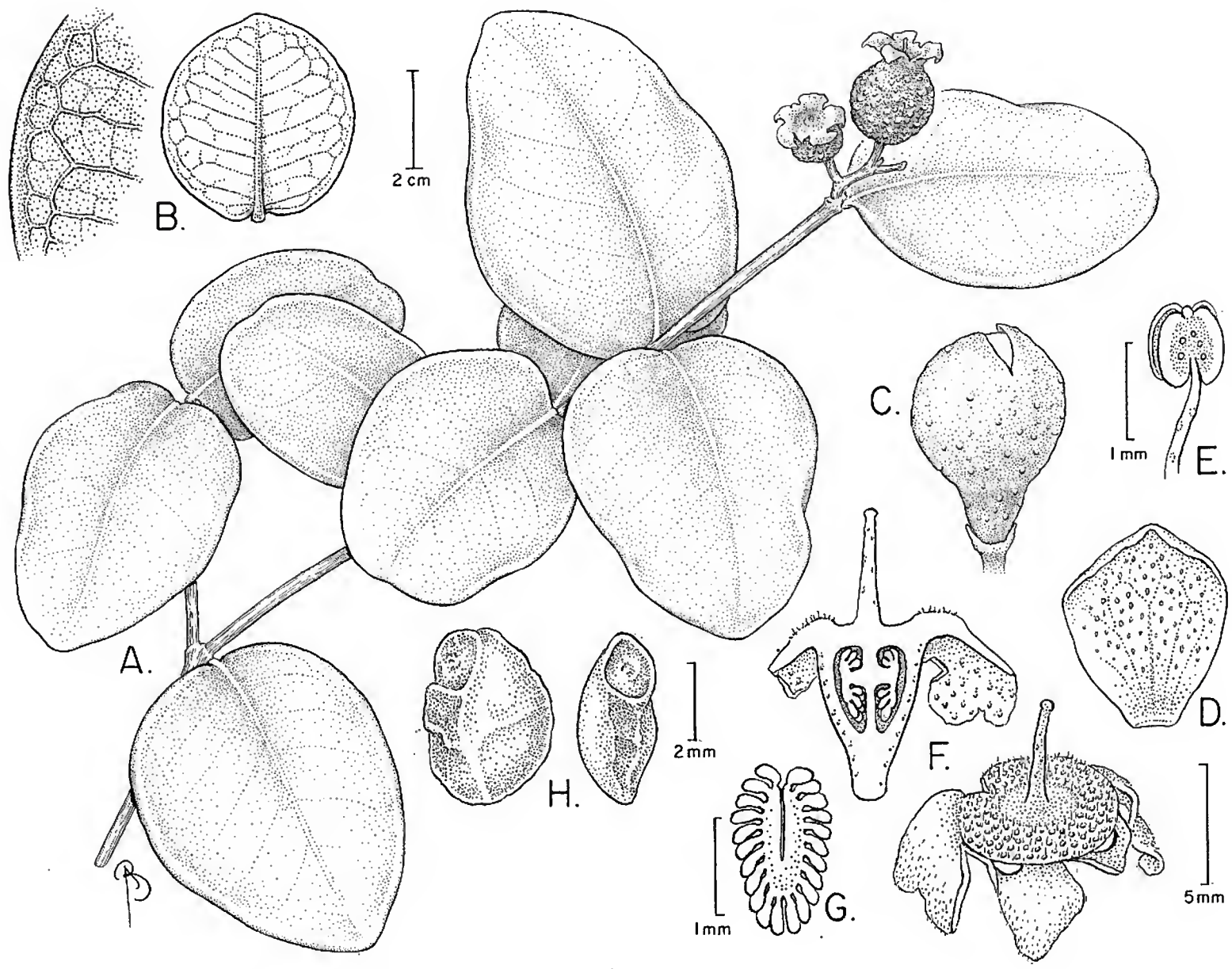
Representative specimen examined. Caetité, [ca. 14.07S, 42.49W], 1 Mar 1993 (ofl), *Guedes et al. 2922* (ALCB24308).

Habitat—Caatinga?
Phenology—Probably flowering in February.
Distinguishing Features—Blades membranous at anthesis, the tertiary venation clearly visible; buds 5–6 mm long, the closed calyx rostrate, the inner surface of calyx hirsutulose; petiole with a protrusion below the point of attachment.

This species is known from a single specimen cited above. In some respects it is similar to *Psidium rhombeum* but differs in having a closed rostrate calyx. It is also separated geographically from known populations of *P. rhombeum* by more than 500

km. It is also similar to *Psidium* sp. B but they are separated by nearly 200 km. It is distinguished from *Psidium* sp. B in the key below.

1. External surfaces of flower buds tomentose, the hairs usually yellowish; closed or nearly closed calyx tearing irregularly, apparently not rostrate; petiole 4–5 mm long. ..... ***P. sp. B***
1' External surfaces of flower buds sparsely strigose, the hairs usually whitish; closed calyx calyptrate, rostrate; petiole 0.5–2 mm long. ..... ***P. sp. C***



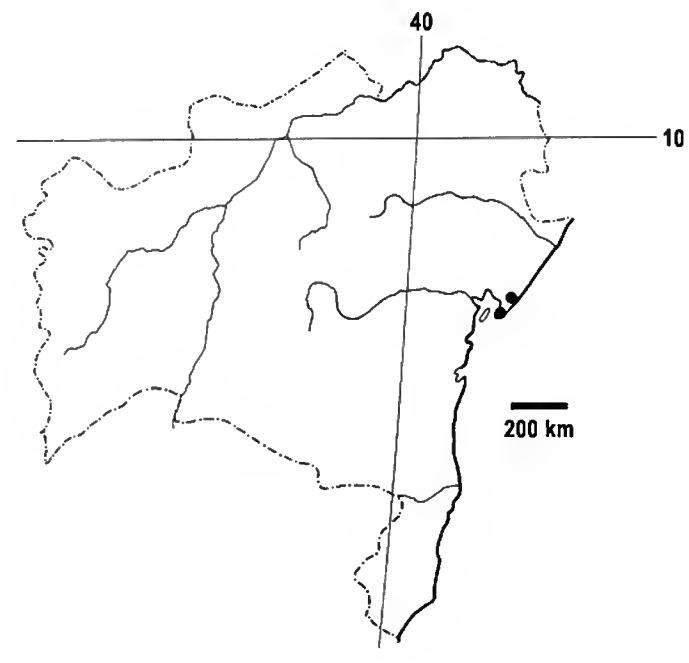
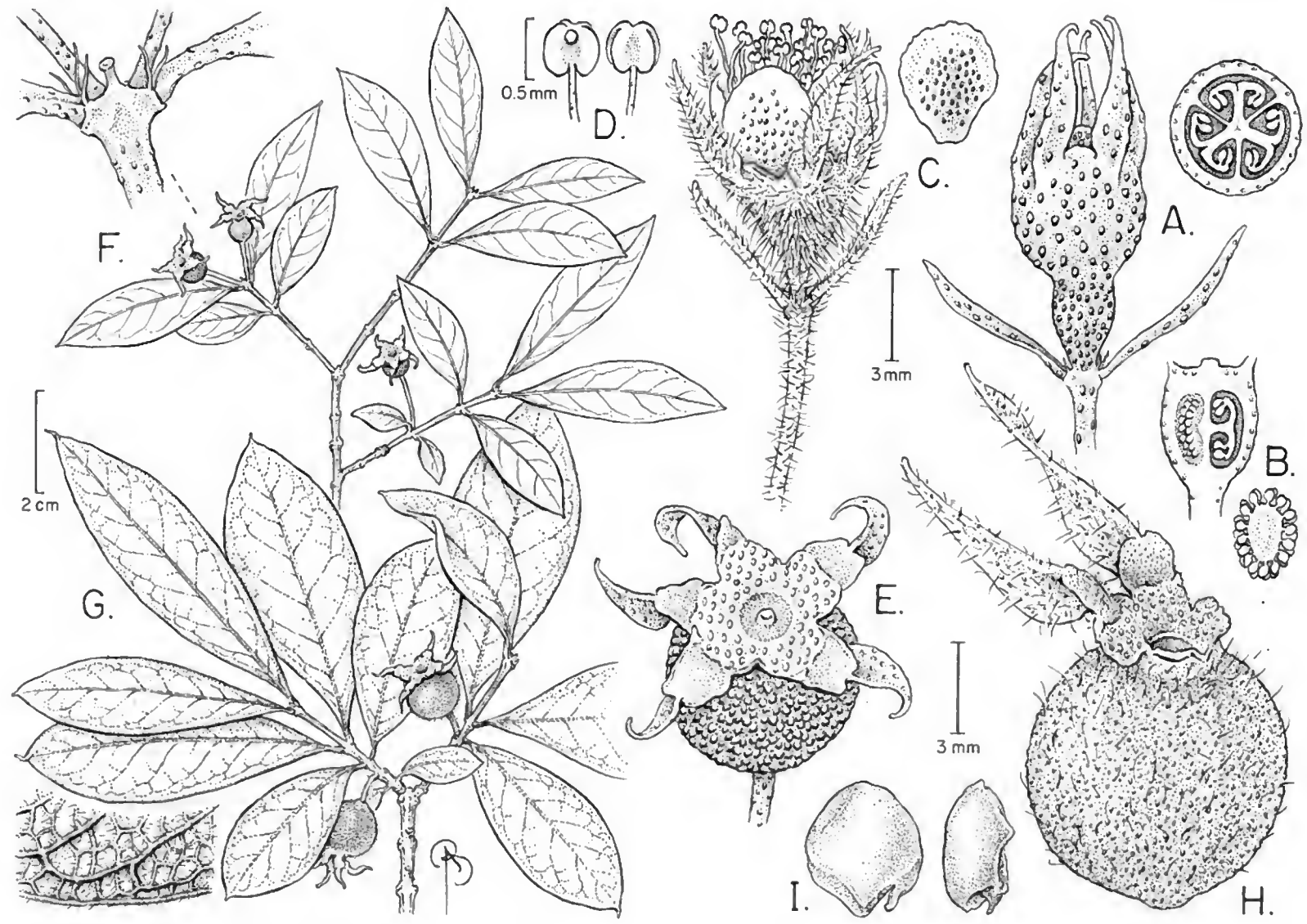


Fig. 5. *Psidium amplexicaule*: illustration and map**. A.** Fruiting twig. **B**. Leaf with close-up of venation. **C**. Opening flower bud. **D**. Petal. **E**. Anther with terminal gland and smaller glands below. **F**. Distal view of flower after anthesis and longitudinal section of the same showing peltate placenta from side. **G**. View of peltate placenta and ovules. **H**. Two views of a seed. Modified from Acevedo-Rodríguez 1996, Fig. 154. (A, from *Acevedo-Rodríguez 2673*, NY; B, G, from *Mejia and Zanoni 7878*, ASU; C, from *Acevedo-Rodríguez 2862*, NY; D–G, from *Peguero et al. 1370*, ASU).



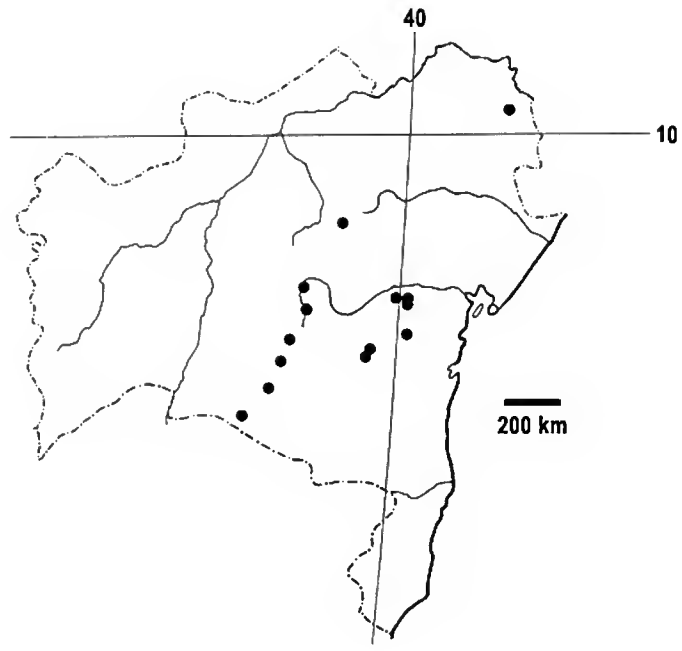


Fig. 6. *Psidium appendiculatum*: illustration and map**. A.** Essentially glabrous flower bud showing how proximal portion of calyx encloses the closed corolla; flange-like appendages protrude from calyx apex. **B**. Cross section of ovary above showing 2 rows of ovules on each lamella of placenta; longitudinal section of ovary and extracted placenta with ovules; all about 2 times size of A. **C**. Pubescent open flower and petal. **D**. Anther with a terminal gland. **E**. Fruit from above showing tears cutting through the staminal ring. **F**. Close-up of node showing stipule-like colleters in leaf axils. **G**. Branch with fruits with a close-up of the venation pattern. **H**. Fruit with two persistent calyx lobes. **I**. Two views of a seed with persistent remnant of placenta. (A, B from *Melo et al. 1426*, HUEFS; C, D from *Melo et al. 1853*, HUEFS; E, F from *França et al. 5120*, ASU; G–I from *Nic Lughadha and Queiroz H53360*, ASU).

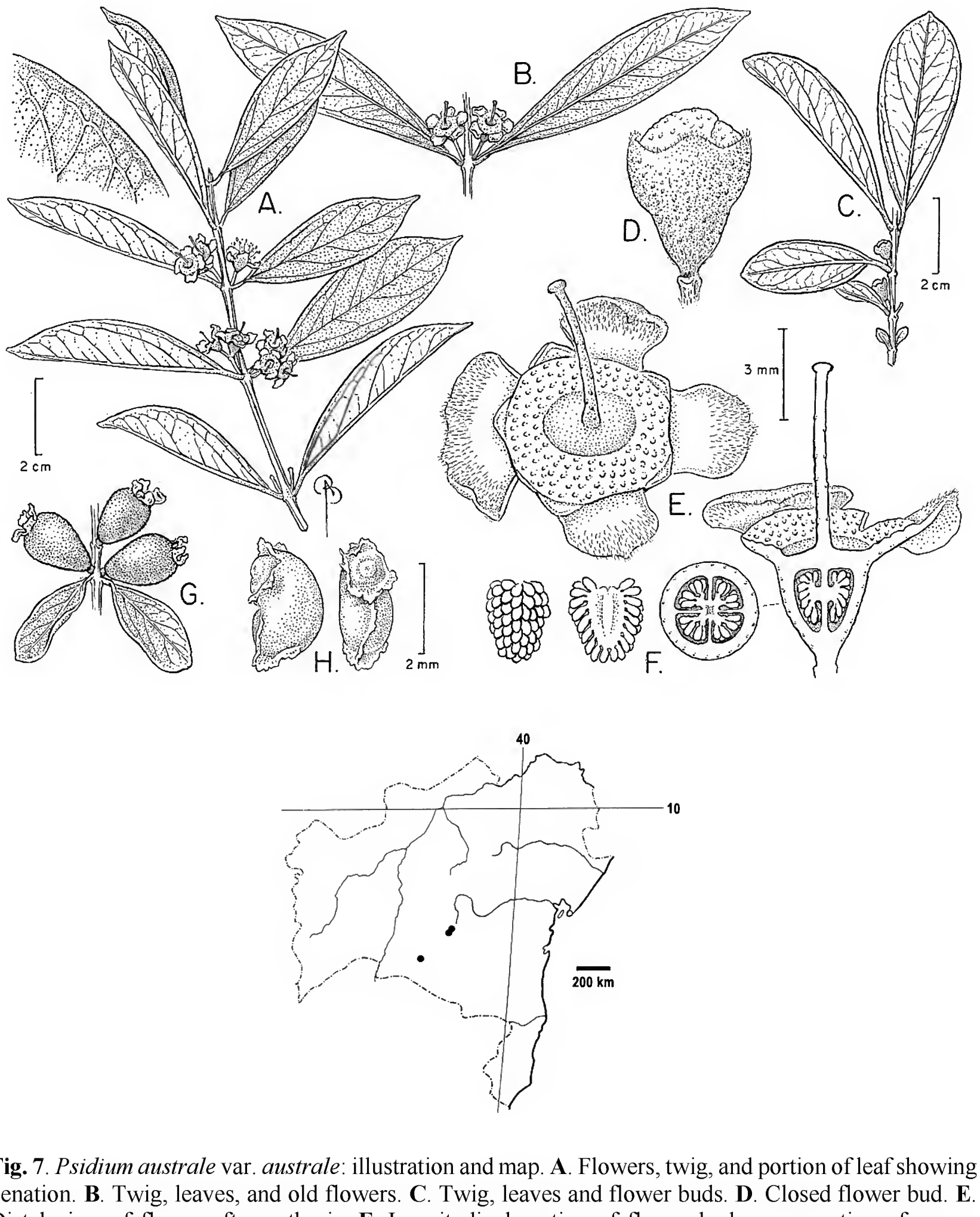
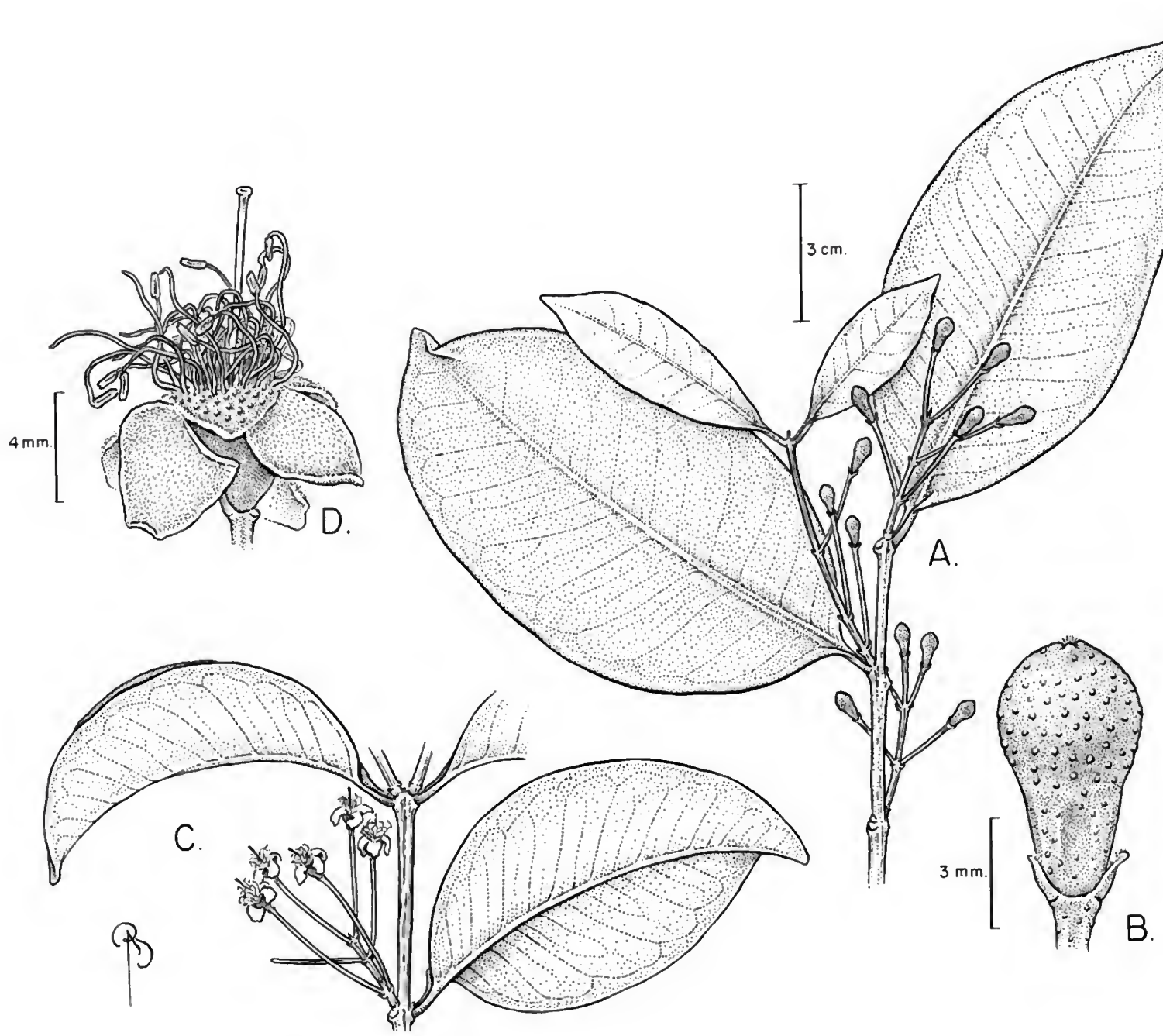


Fig. 7. *Psidium australe* var. *australe*: illustration and map. **A**. Flowers, twig, and portion of leaf showing venation. **B**. Twig, leaves, and old flowers. **C**. Twig, leaves and flower buds. **D**. Closed flower bud. **E**. Distal view of flower after anthesis. **F**. Longitudinal section of flower bud; cross section of ovary; extracted placenta and ovules: adaxial view on right and abaxial view on left. **H**. Two views of seed with remnants of endocarp attached. (A, E and F from *Silva 739*, ASU; B from *Hatschbach 55798*, ASU; C, D from *Landrum 8798*, ASU; G from *Zardini 9027*, ASU; H from *Oliveira 359*, ASU).



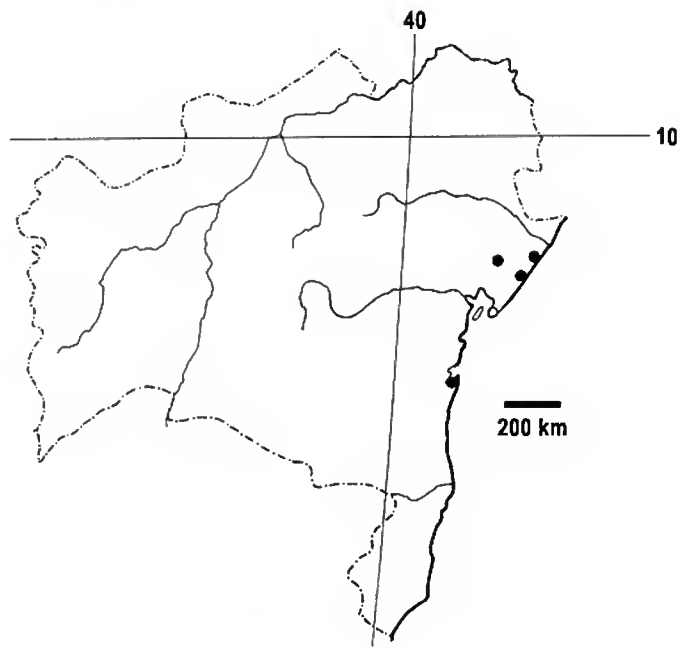


Fig. 8. *Psidium bahianum*: illustration and map. **A**. Twig with leaves and bracteate shoot inflorescences, one of which terminates in a pair of immature leaves. **B**. Closed flower bud, showing small terminal pore. **C**. Twig showing arching leaves and inflorescence after anthesis. **D**. Open flower with petals having fallen. (A, B from *Jesus 1384*, HUEFS, holotype; C, D from *Jesus 1389*, HUEFS).

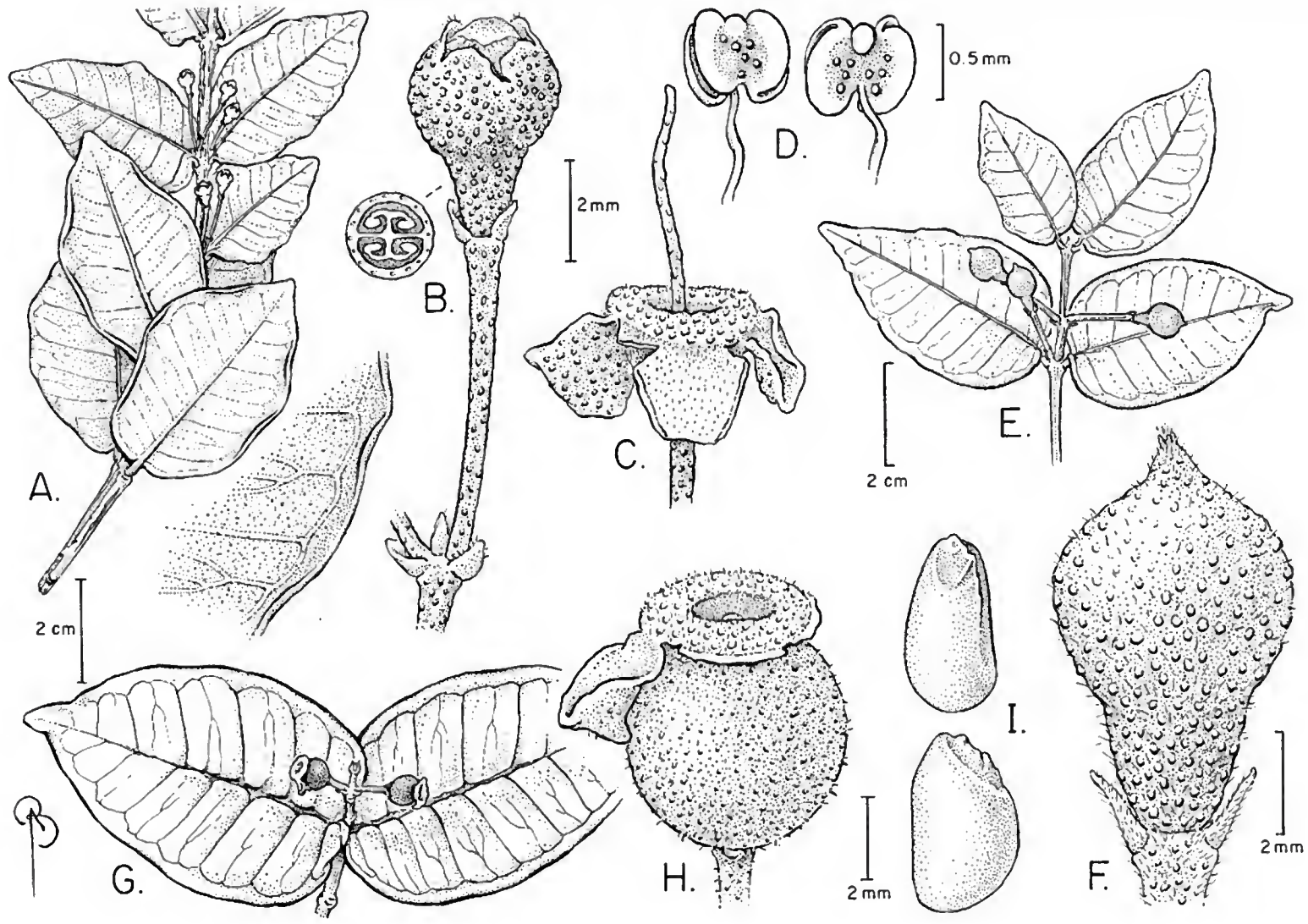
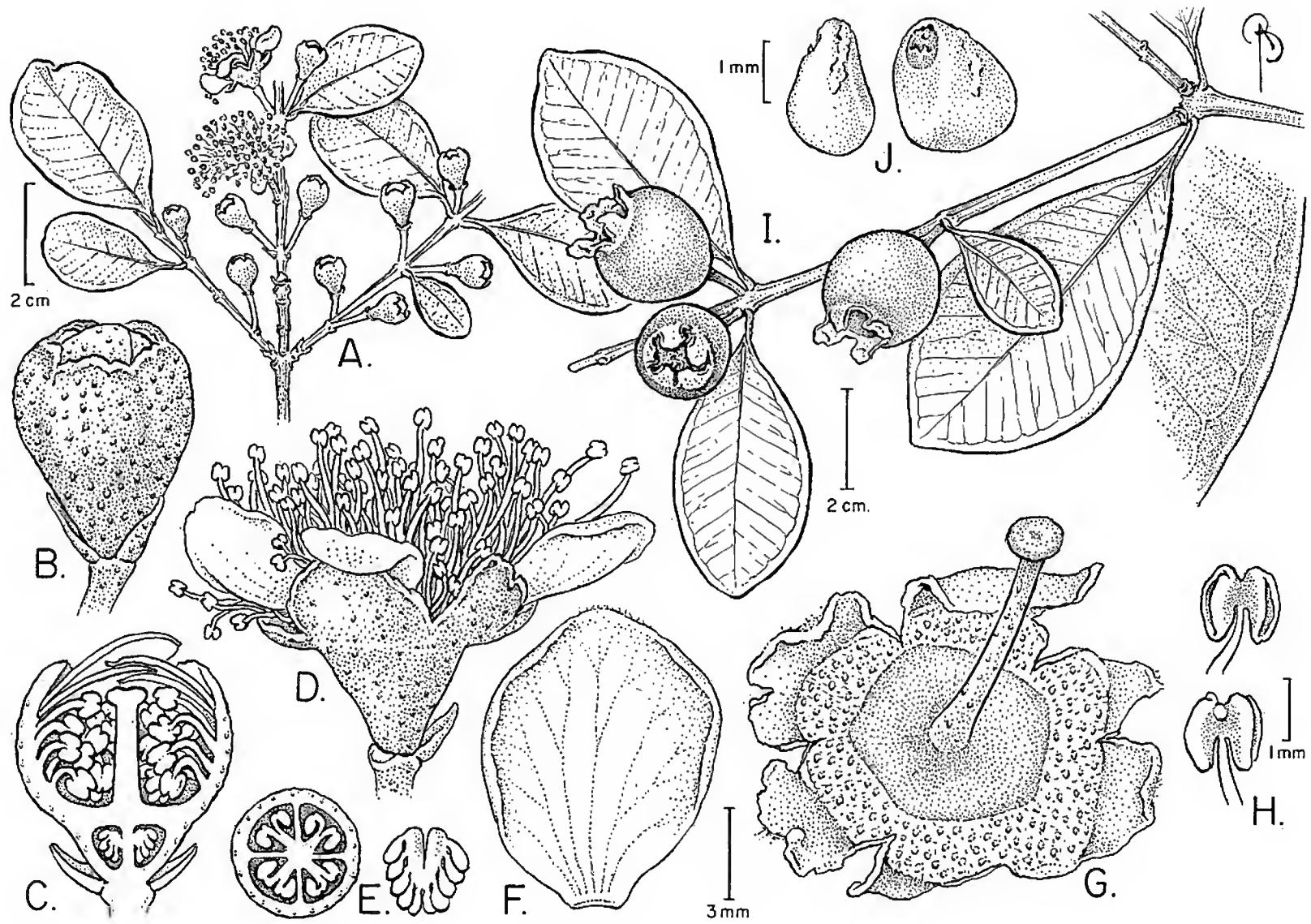


Fig. 9. *Psidium brownianum*: illustration and map. **A**. Twig with leaves and flower buds. **B.** Closed flower bud with a 4-lobed calyx; cross section of ovary showing two locules and peltate placenta. **C**. Flower after anthesis. **D**. Anthers with terminal gland and smaller glands below. **E**. Twig with leaves and closed flower buds. **F**. Closed flower bud with calyptrate calyx. **G**. Twig with two sessile leaves and two fruits. **H**. Young fruit with persistent calyptrate calyx. **I**. Seed from two views. (A–D from *Hatschbach et al. 71567*, ASU; E, F from *Harley et al. 50439*, ASU; G–I from *Stannard et al. H515615*, ASU).



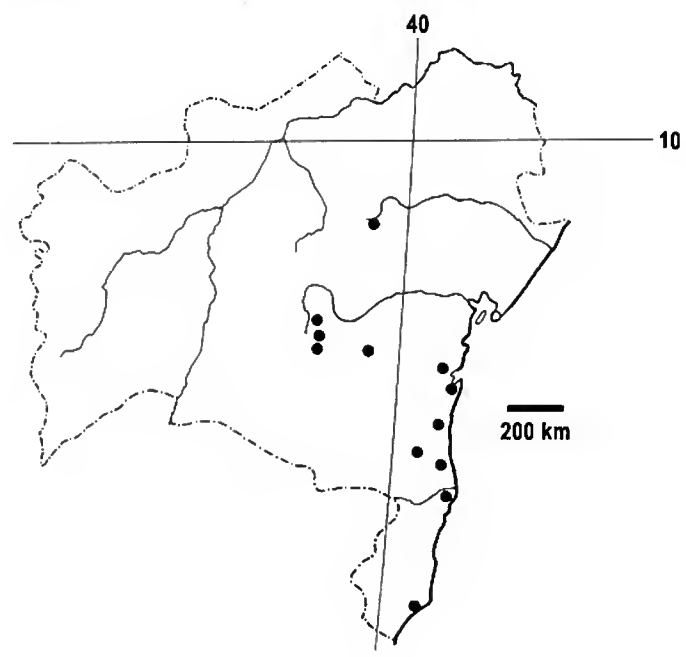
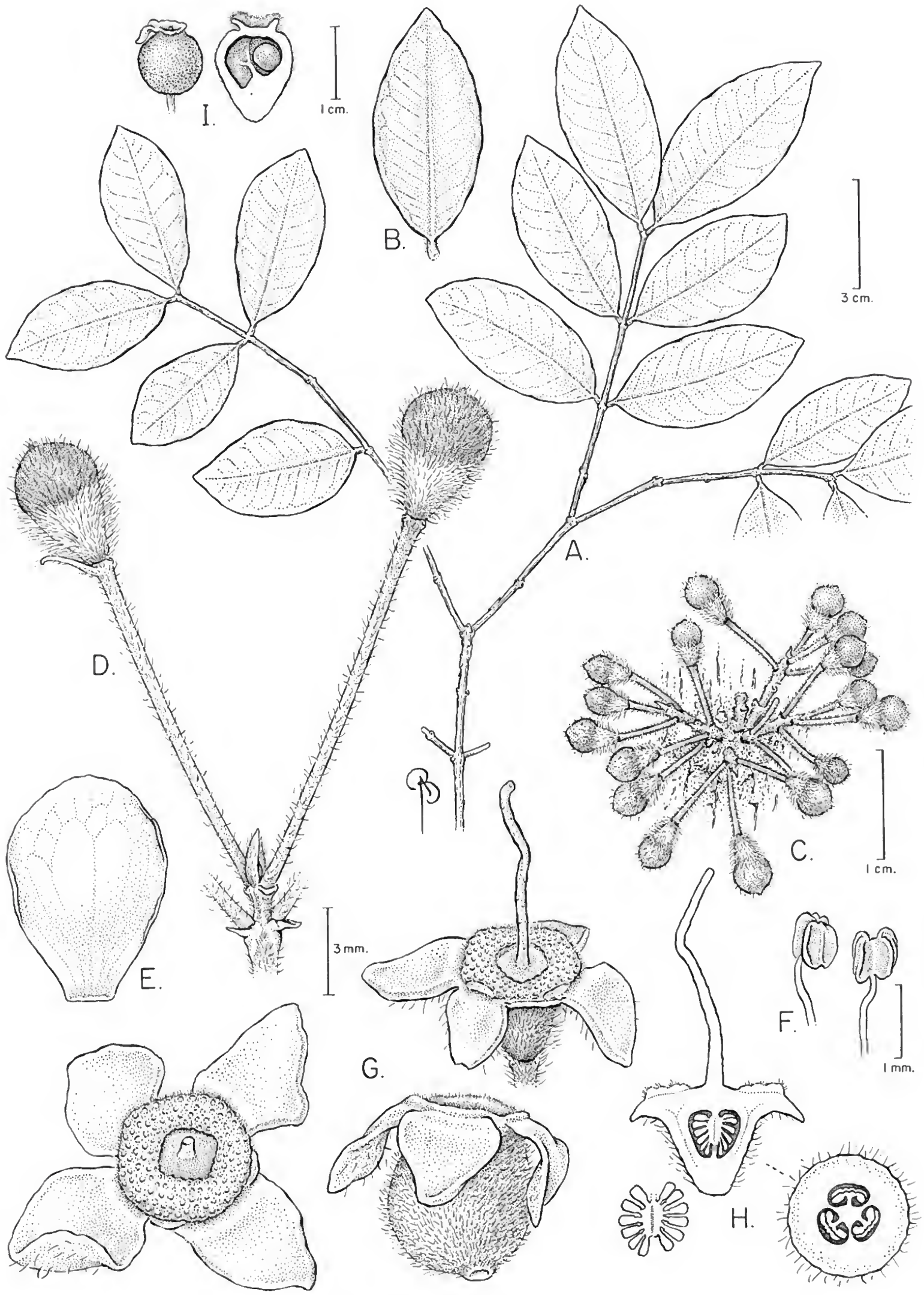


Fig. 10. *Psidium cattleyanum*: illustration and map. **A**.Twig at beginning of anthesis. **B**. Flower bud. **C**. Longitudinal section of flower bud. **D**. Opening flower. **E**. Cross section of ovary and extracted placenta with ovules. **F**. Petal. **G**. Apical view of flower after anthesis showing tears in calyx cutting into staminal ring. **H**.Two views of stamen and anther with single terminal gland. **I**. Fruiting twig. **J**. Seeds. (A–C from *Rossato et al. 4855*, ASU; D from photograph of live specimen; E–H from *Folli 4925*, ASU; I from from *Baitello 414* , ASU; J from *Carvalho et al. 6859*, ASU).



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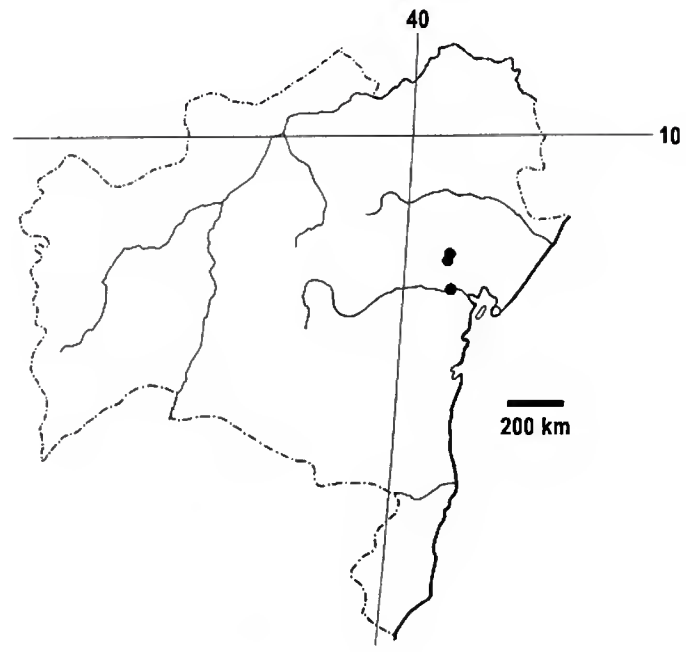
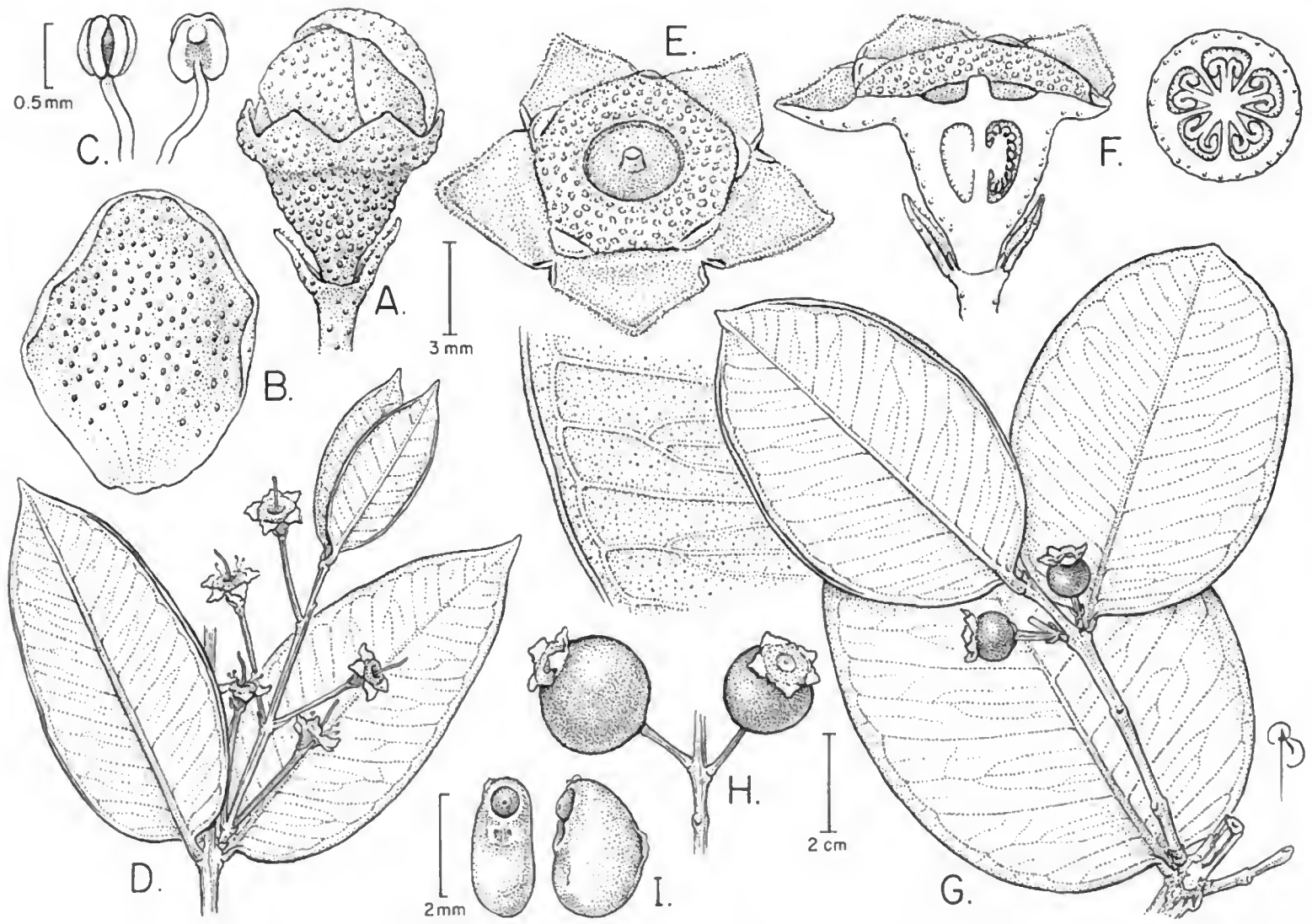


Fig. 11. *Psidium cauliflorum*: illustration (on previous page) and map. **A**. Young branch and leaves. **B**. Upper surface of single leaf. **C**. Cauliflorous inflorescence. **D**. Portion of inflorescence with two closed buds. **E**. Detached petal. **F**. Anthers. **G**. Remnants of flowers and young fruit after stamens and petals have fallen. **H**. Longitudinal section of old flower; cross section of ovary; extracted placenta with ovules. **I.** Fruit and single seed. (A, B, I from *Grupo Pedra do Cavalo 326*, ALCB; C from *Grupo Pedra do Cavalo 955*, HRB, the holotype; D–H from *Queiroz et al. 1742*, ASU).



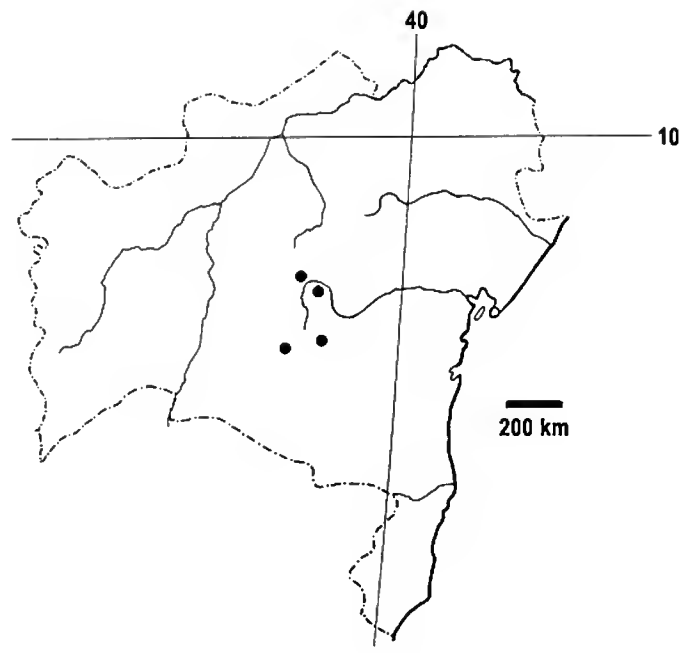


Fig. 12. *Psidium firmum*: illustration and map. **A**. Closed flower bud. **B**. Petal showing numerous glands. **C**. Anther with a single terminal gland. **D**. Flowering twig shortly after anthesis. **E**. Apex of flower after anthesis showing short tears in calyx that do not penetrate the staminal ring and scars left by stamens and petals. **F**. Longitudinal and cross section of ovary showing five locules and peltate placenta. **G**. Twig with leaves and fruits and close-up of venation pattern showing how tertiary veins seem to arise from the marginal vein. **H**. Fruits with persistent calyx lobes. **I**. Two views of a seed with operculum near top. (A–C from *Filgeiras and Lopes 2406*, ASU; D–F from *Proença et al. 1445*, ASU; G from *Proença et al. 1467*, ASU; H, I from *Irwin et al. 9189*, MICH).

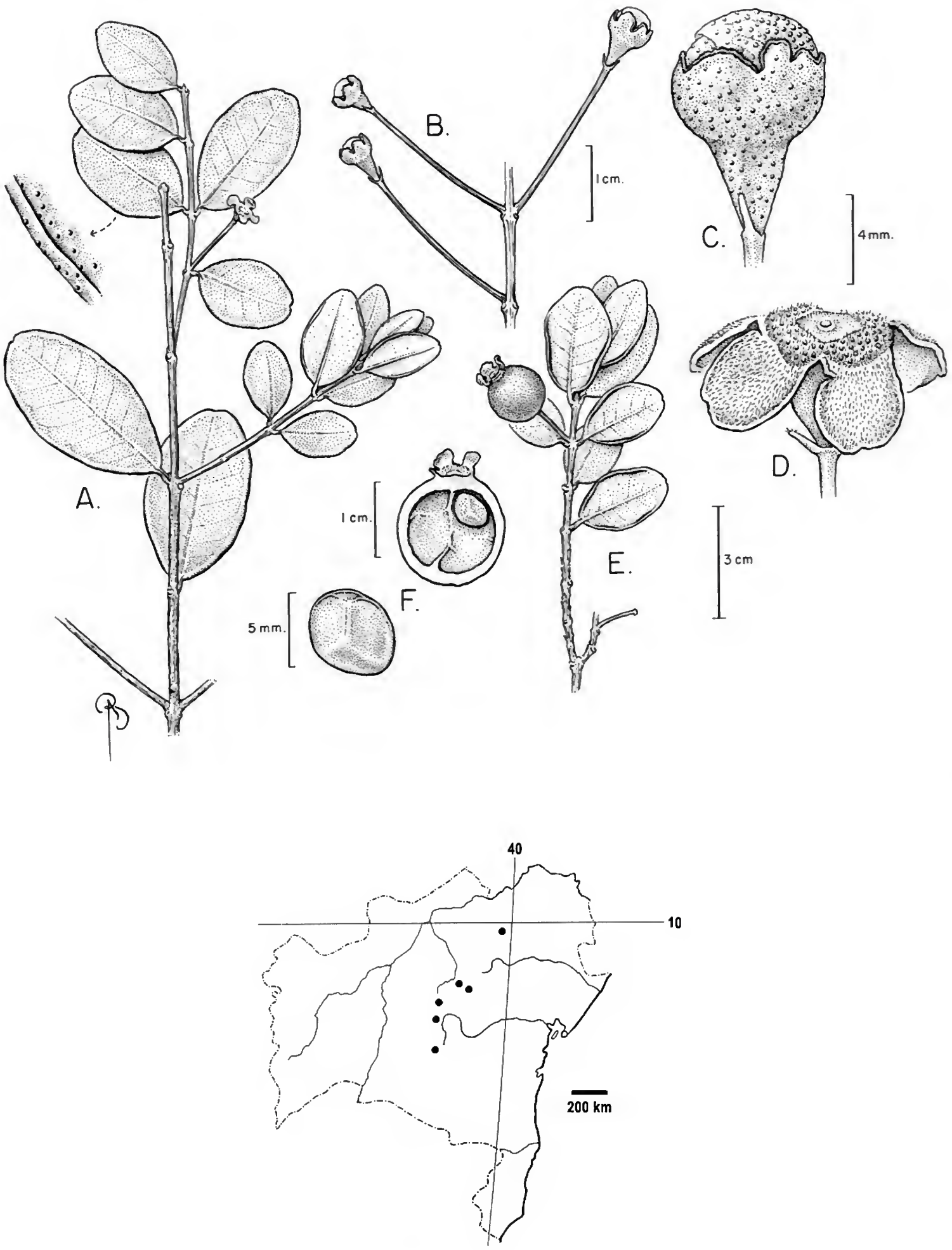
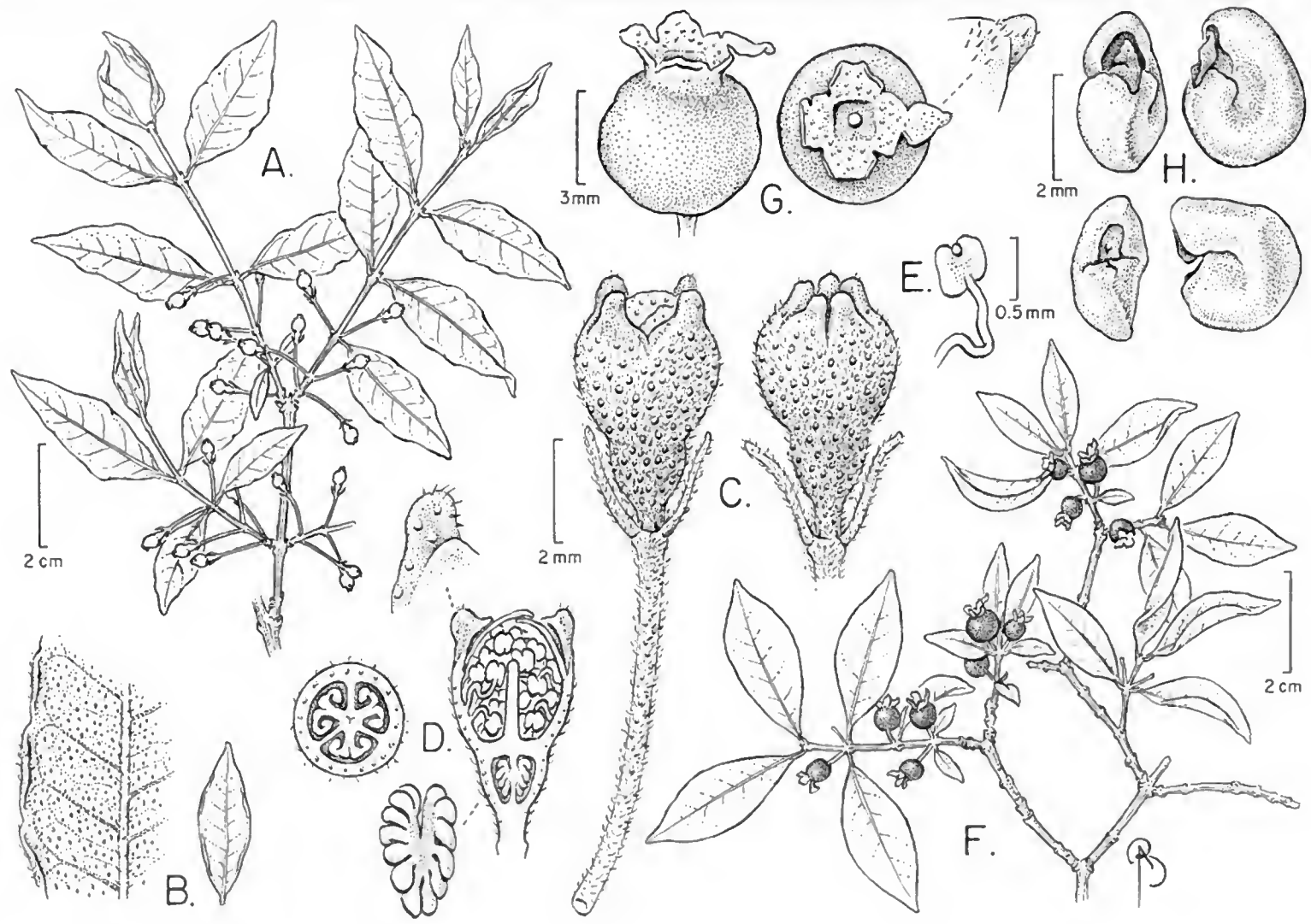


Fig. 13. *Psidium ganevii*: illustration and map. **A**. Twig with leaves and old flower. **B**. Portion of a bracteate shoot inflorescence. **C**. Flower bud with tears developing in calyx. **D**. Flower after petals and stamens have fallen. **E**. Twig with leaves and fruit. **F**. Opened fruit and seed. (A from *Miranda 90*, ASU; B–D from *Ganev 1518*, HUEFS, holotype; E, F from *França et al. 2834*, ASU).



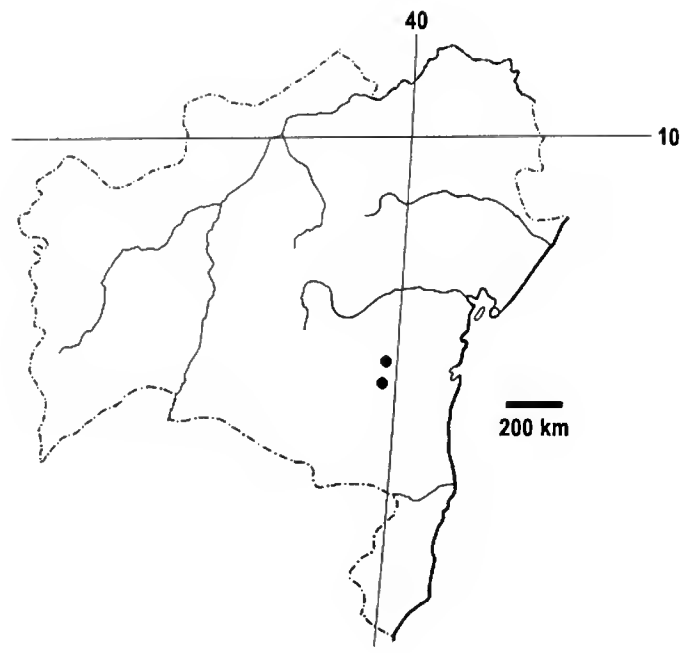
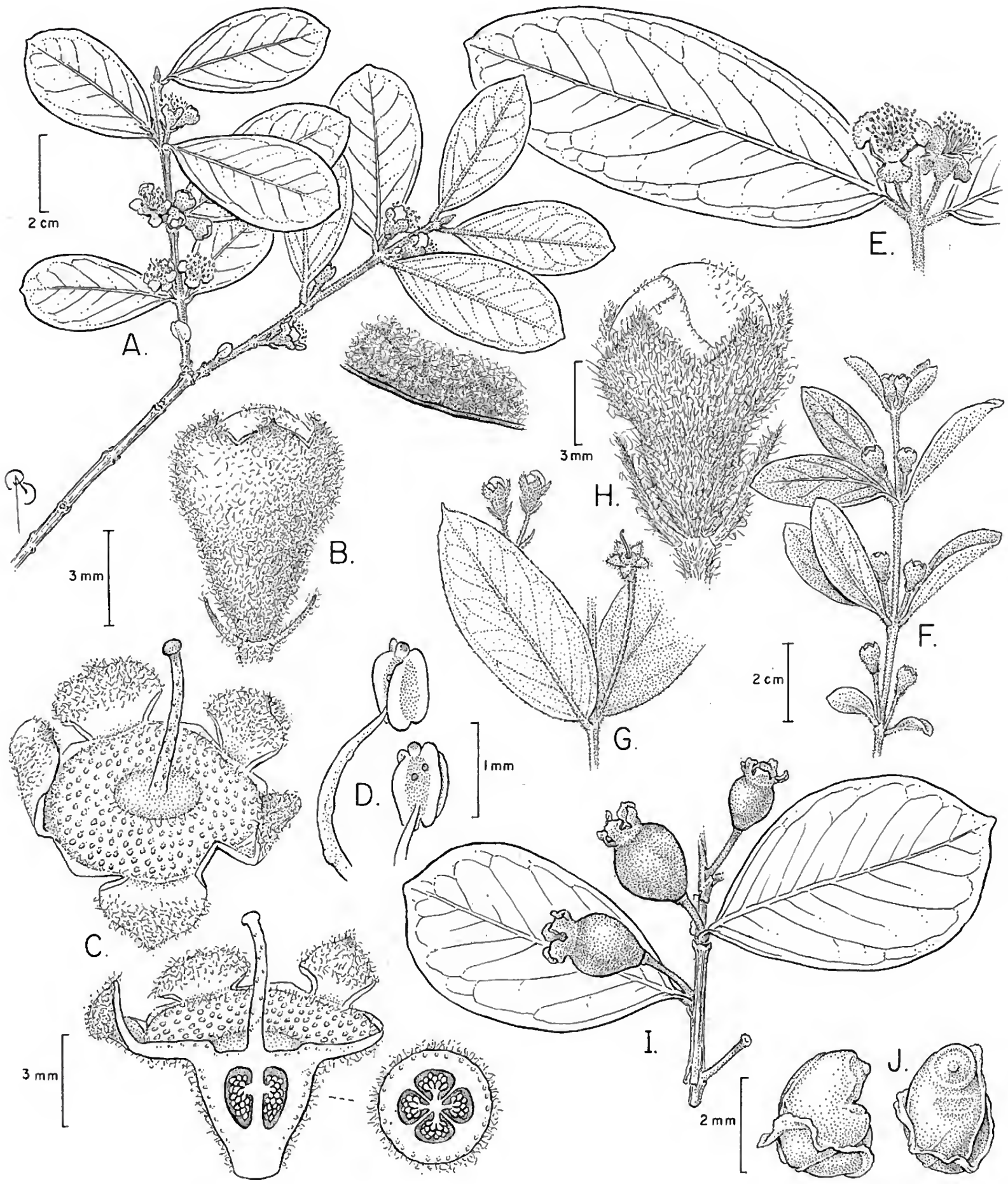


Fig. 14. *Psidium glaziovianum*: illustration and map. **A**. Branch with flower buds. **B**. Typical leaf with close-up of venation pattern. **C**. Two flower buds, 4-merous on left and 5-merous on right. **D**. Longitudinal section of flower bud; cross section of ovary; placenta and with ovules extracted. **E**. Anther with terminal gland. **F**. Branch with fruits. **G**. Fruit from side and above showing tears in staminal ring. **H**. Views of two immature seeds. (A–E from *Mori et al. 11212*, NY; F, H above, from *Taylor et al. 1466*, ASU; G, H below, from *Mattos Silva et al. 281*, ASU).



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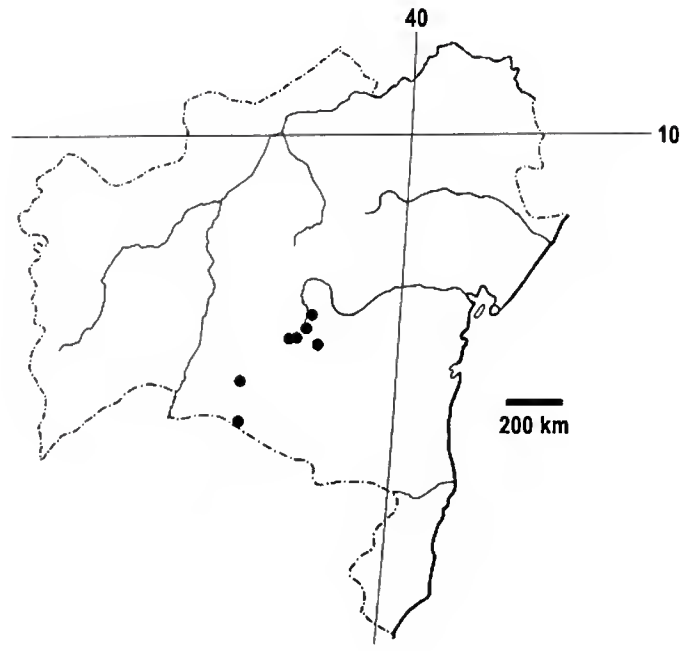


Fig. 15. *Psidium grandifolium*: illustration (on previous page) and map. **A**. Branch with leaves, flower buds, and open flowers. **B**. Closed flower bud (northern form). **C**. Apex of flower after anthesis, tears in the calyx scarcely cutting the staminal ring. **D**. Two views of anther with terminal gland and 2 smaller glands below. **E**. Node with two leaves and to open flowers. **F**. Shoot with 3-leaved whorls at 2 nodes and flower buds. **G**. Node with 2 leaves, 2 flower buds (part of a dichasium) and a single flower after anthesis. **H**. Closed flower bud (southern form). **I.** Shoot with two alternate leaves (occasionally found in this species) and 3 fruits. **J**. Two views of a seed with remnants of endocarp attached. (A–D from *Harley 26964*, ASU; E from *Gottsberger 11-27990*, ASU; F from *Krapovickas 45798*, ASU; G–H, *Carnevali 4947*, ASU; I–J from *Souza 10407*, ASU).

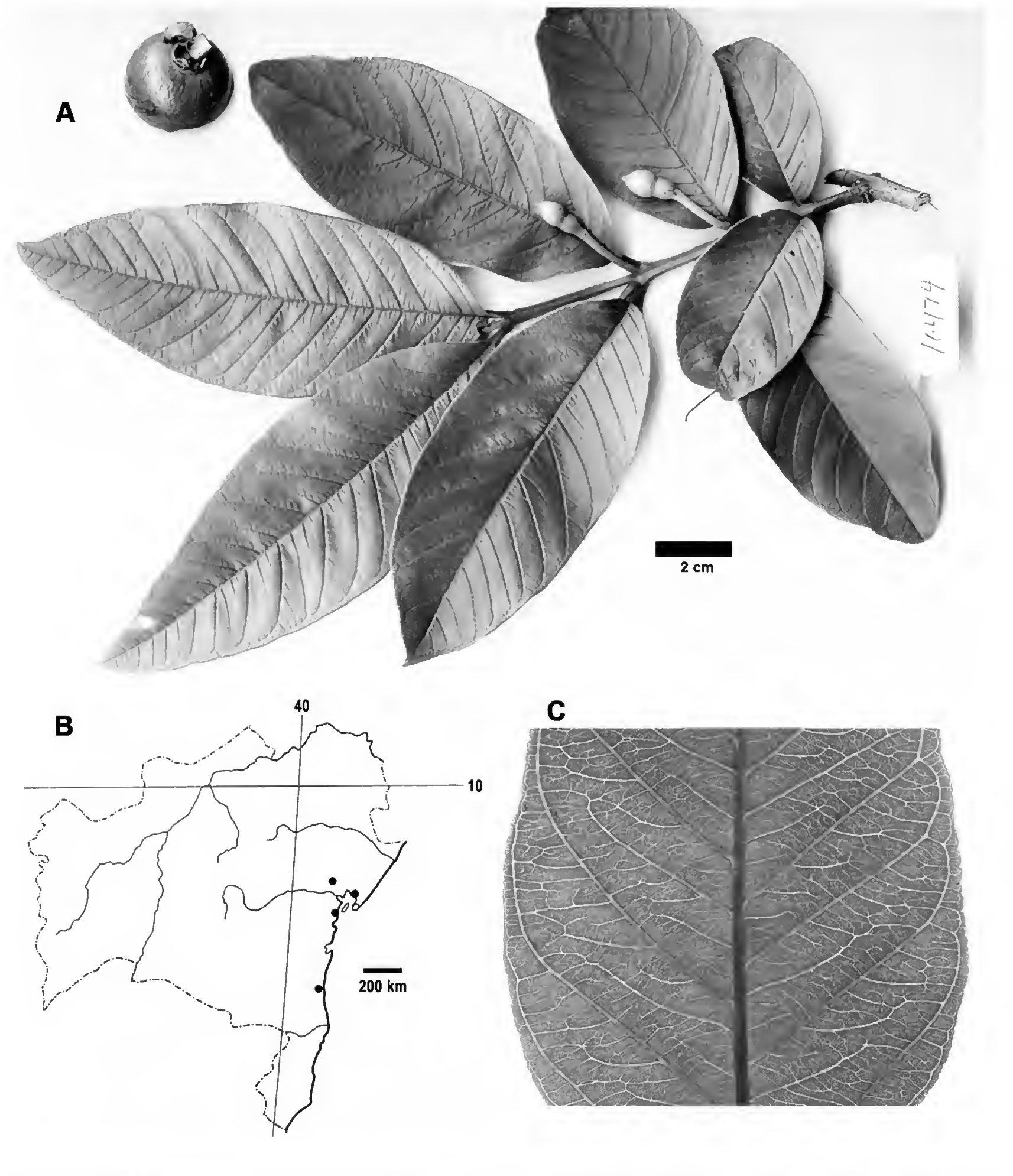
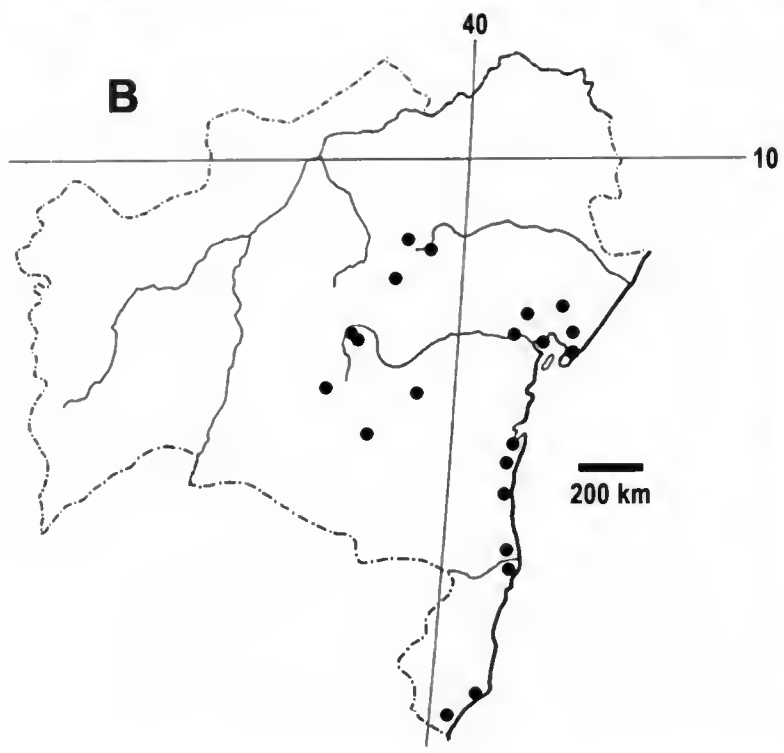


Fig. 16. *Psidium guajava.* **A**. Photo of *Landrum 10474* from Costa Rica, Puntarenas, San Luis Ecolodge. **B**. Distribution in Bahia. **C**. Scan of leaf showing venation pattern of plant cultivated in Arizona, the seeds from Mexico.



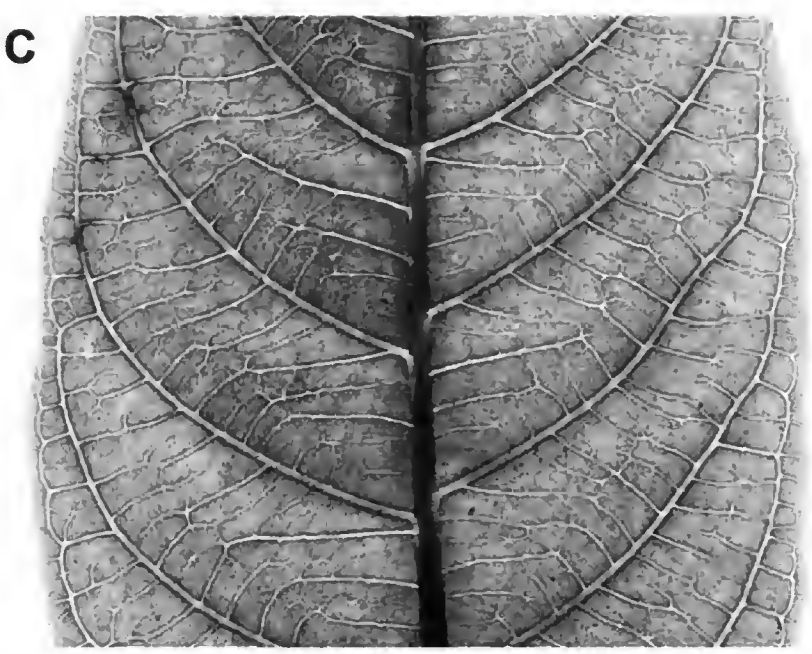


Fig. 17. *Psidium guineense*. **A**. Photo of plant in flower, cultivated in Arizona, the seeds originally collected in Chiapas, Mexico. **B**. Map of distribution in Bahia. **C**. Scanned portion of leaf showing venation pattern, from plant cultivated in Arizona with unknown provenance.

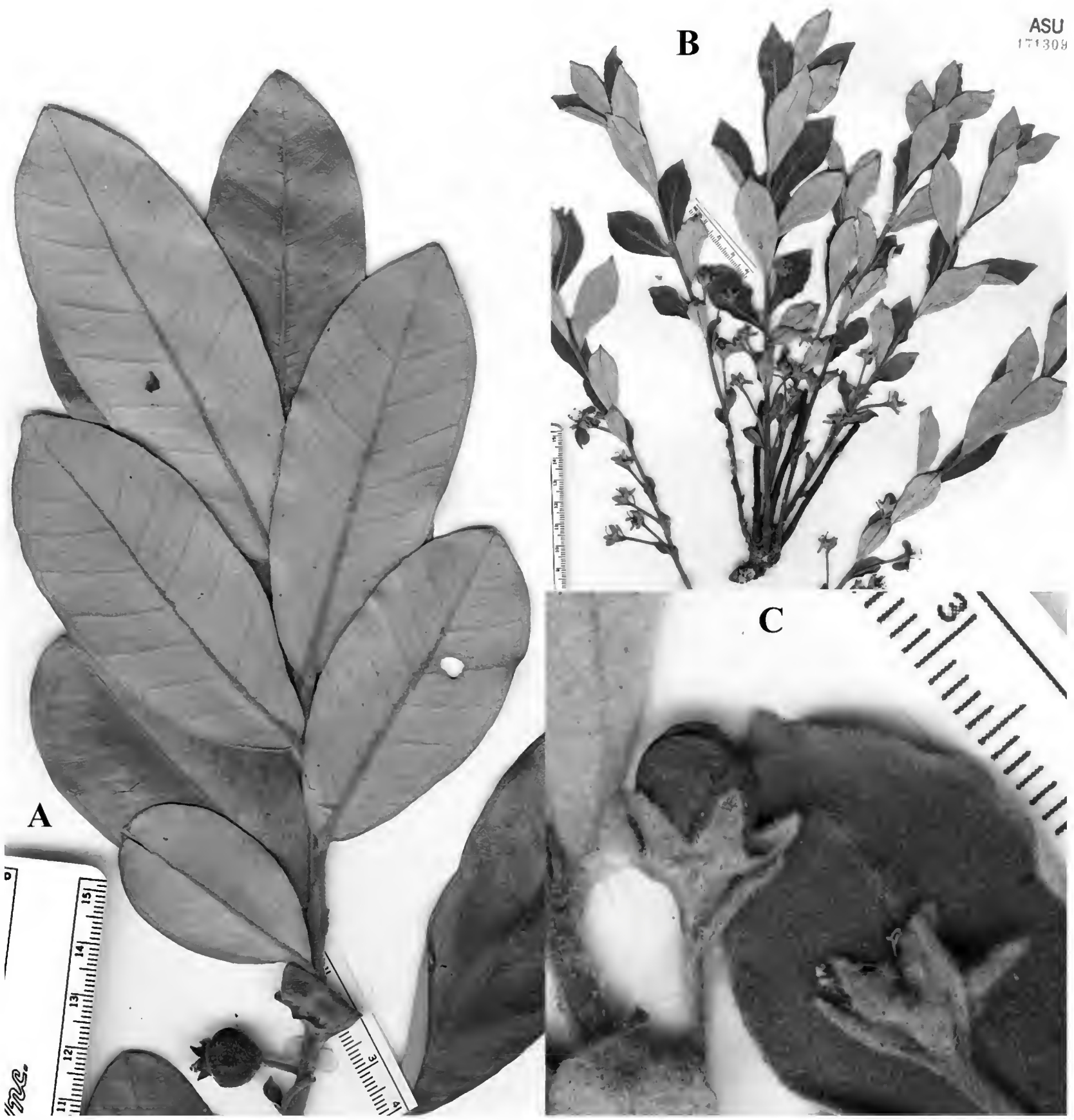
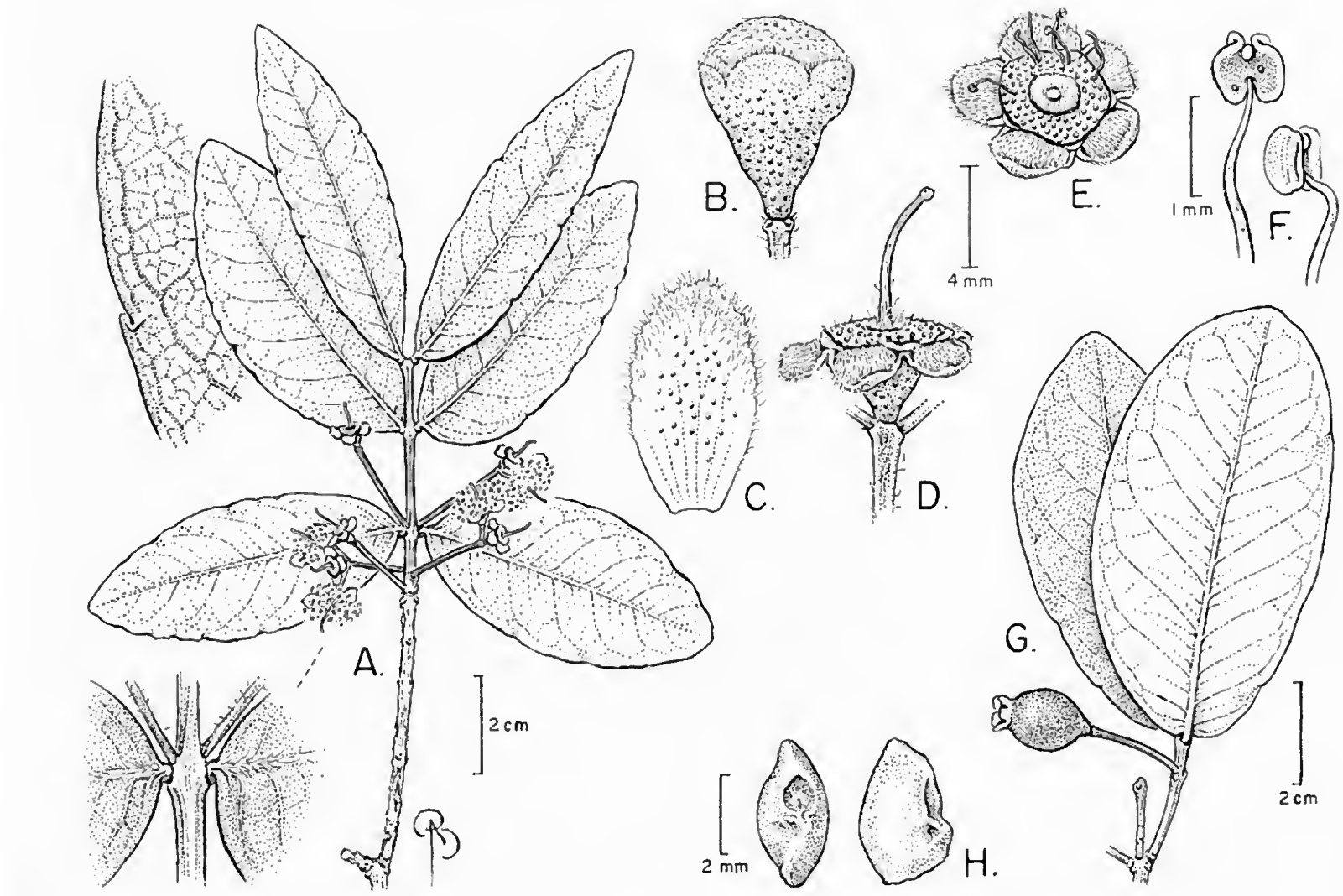


Fig. 18. *Psidium laruotteanum*. **A**. Young branch of 0.7 m shrub; note large leaves. **B**. Portion of an herbarium specimen showing full stature of plant with new growth arising from ground level stem. **C**. Close view of flowers. No verified specimens have been seen by the author from Bahia, but this species has been reported by others and is likely to grow there. (A, *Ribas and Pereira 1812*, ASU; B, C, *Hatschbach 53638*, ASU). Reproduced from Landrum (2003).



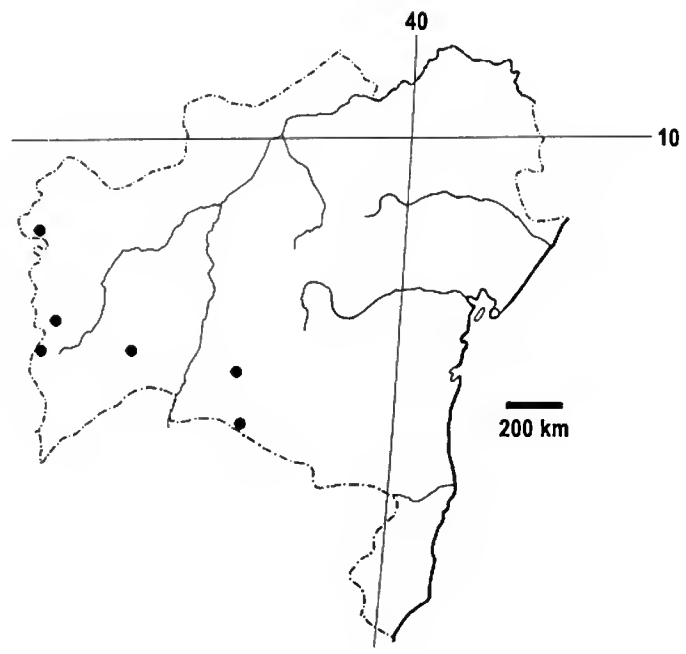
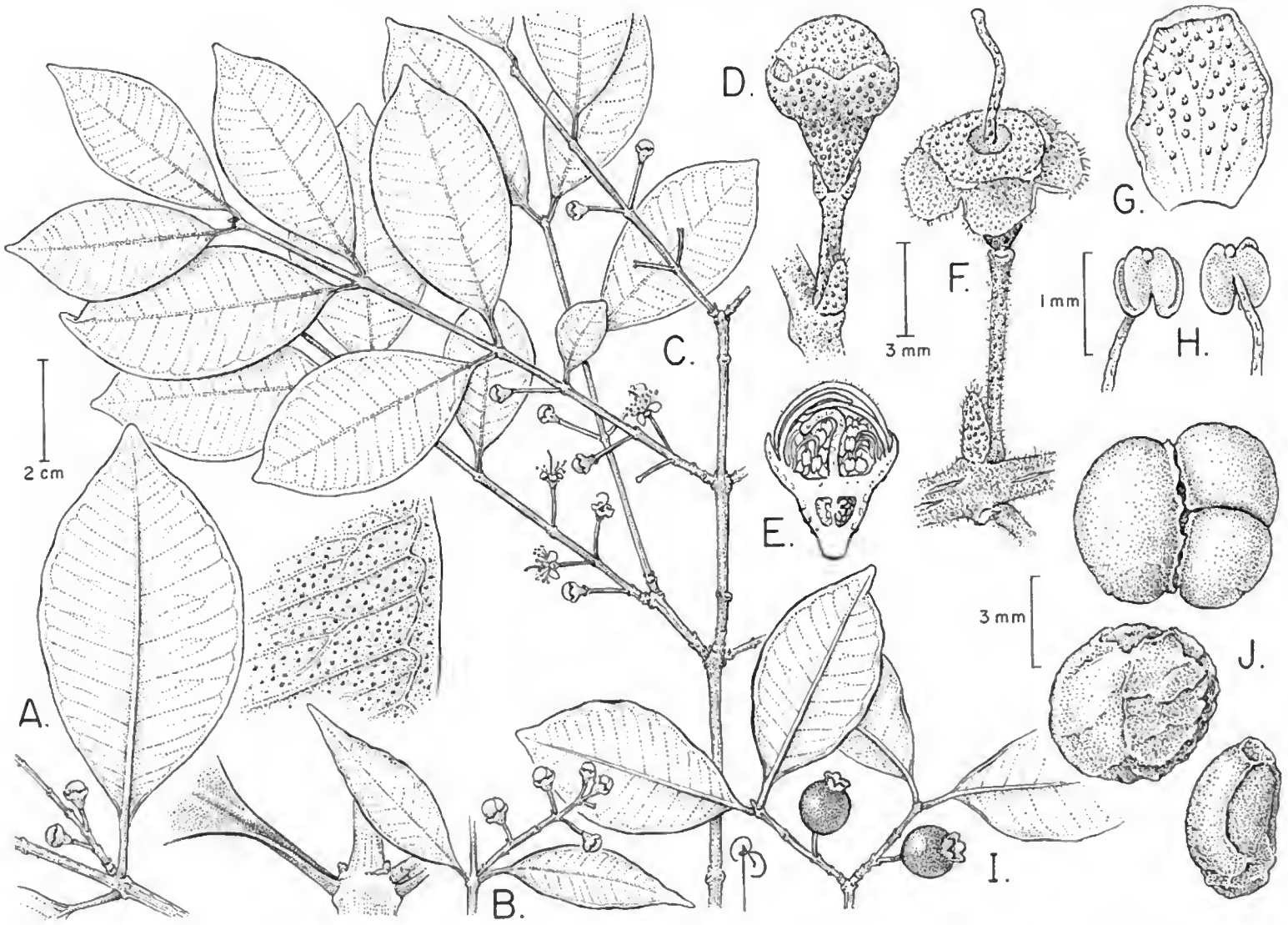


Fig. 19. *Psidium myrsinites*: illustration and map. **A**. Branch with 3-flowered and uniflorous peduncles; with close-ups of node and venation pattern. **B**. Flower bud. **C**. Petal. **D**. Central flower of a dichasium after anthesis. **E**. Apex of flower after anthesis showing short tears between the calyx lobes not penetrating the staminal ring. **F**. Anther with terminal gland and 2 smaller glands below. **G**. Twig with leaves and fruit. **H**. Seed. (A–D, F *Alvarenga 876*, ASU; E *Stadnick 101*, ASU-photos; G, H *Azevedo et al. 1098*, ASU).



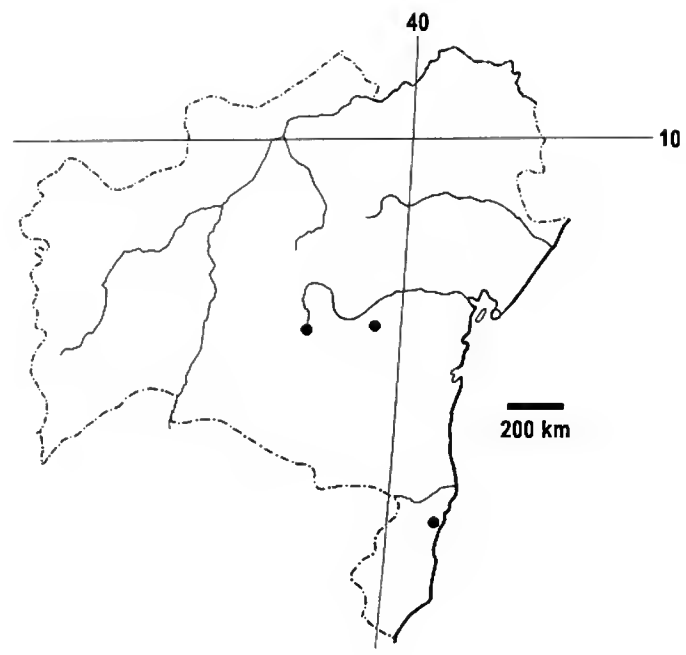


Fig. 20. *Psidium myrtoides*: illustration and map. **A**. Portion of flowering twig showing one leaf with close-up of venation pattern. **B**. Portion of flowering twig showing bracteate shoot with five flowers persisting. **C**. Branch with flowers and buds at proximal nodes. **D**. Flower bud in axil of bract. **E**. Longitudinal section of flower bud. **F**. Flower after anthesis showing tears between calyx lobes that do not penetrate the staminal ring. **G**. Petal with numerous glands. **H**. Anther with a single terminal gland. **I**. Twig with fruits. **J**. Cluster of three seeds as they are found in a fruit, with rounded sides towards fruit wall and flat sides abutting adjacent seeds; two single seeds with persistent endocarp tissue. (A from *Hatschbach 51897*, ASU; B from *Kawasaki 863*, ASU; C, E–H from *Hatschbach et al. 71498*, ASU; D from *Kawasaki 874*, ASU; I from *Folli 1829*, ASU; J from *Pereira s.n.*, ASU).

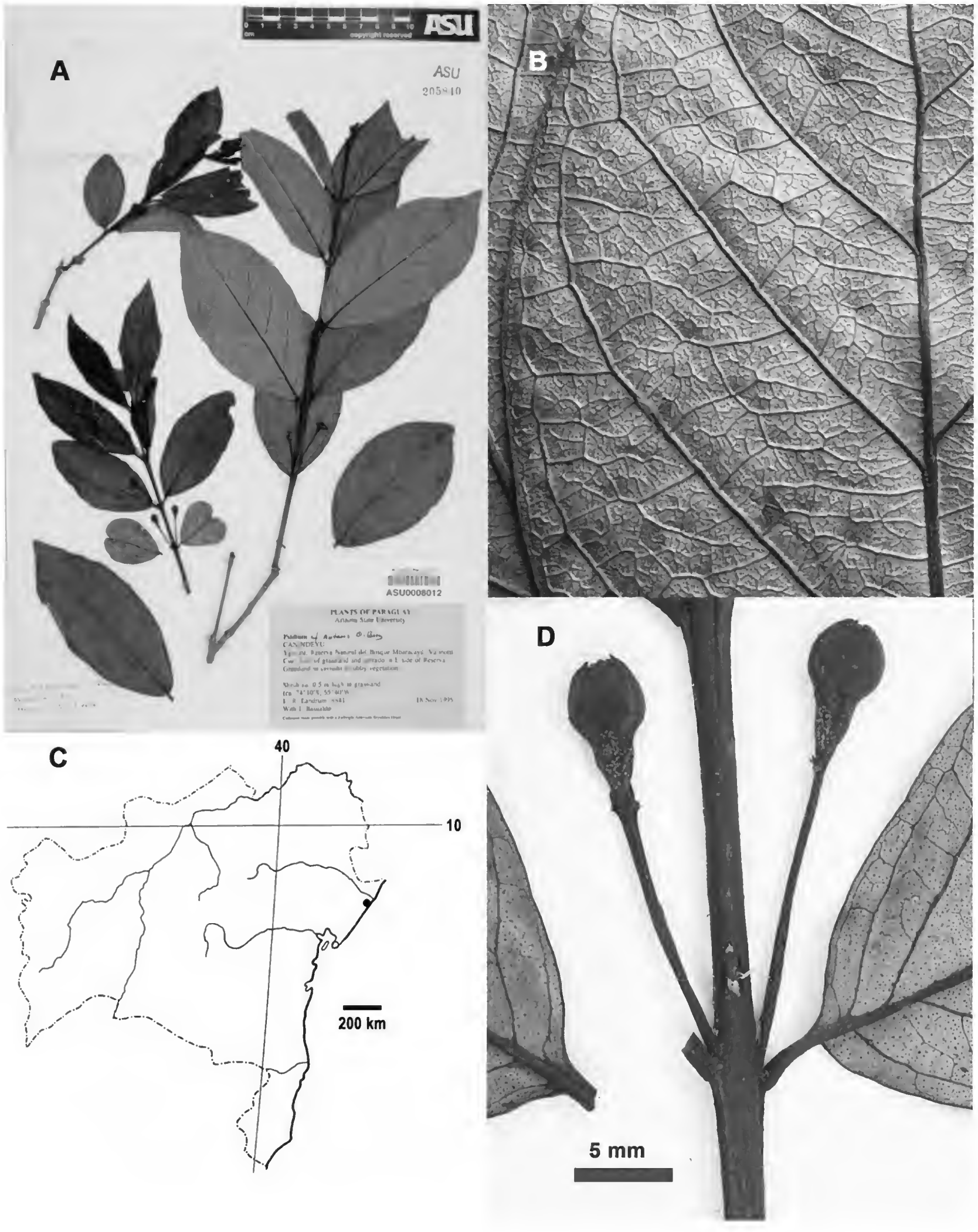
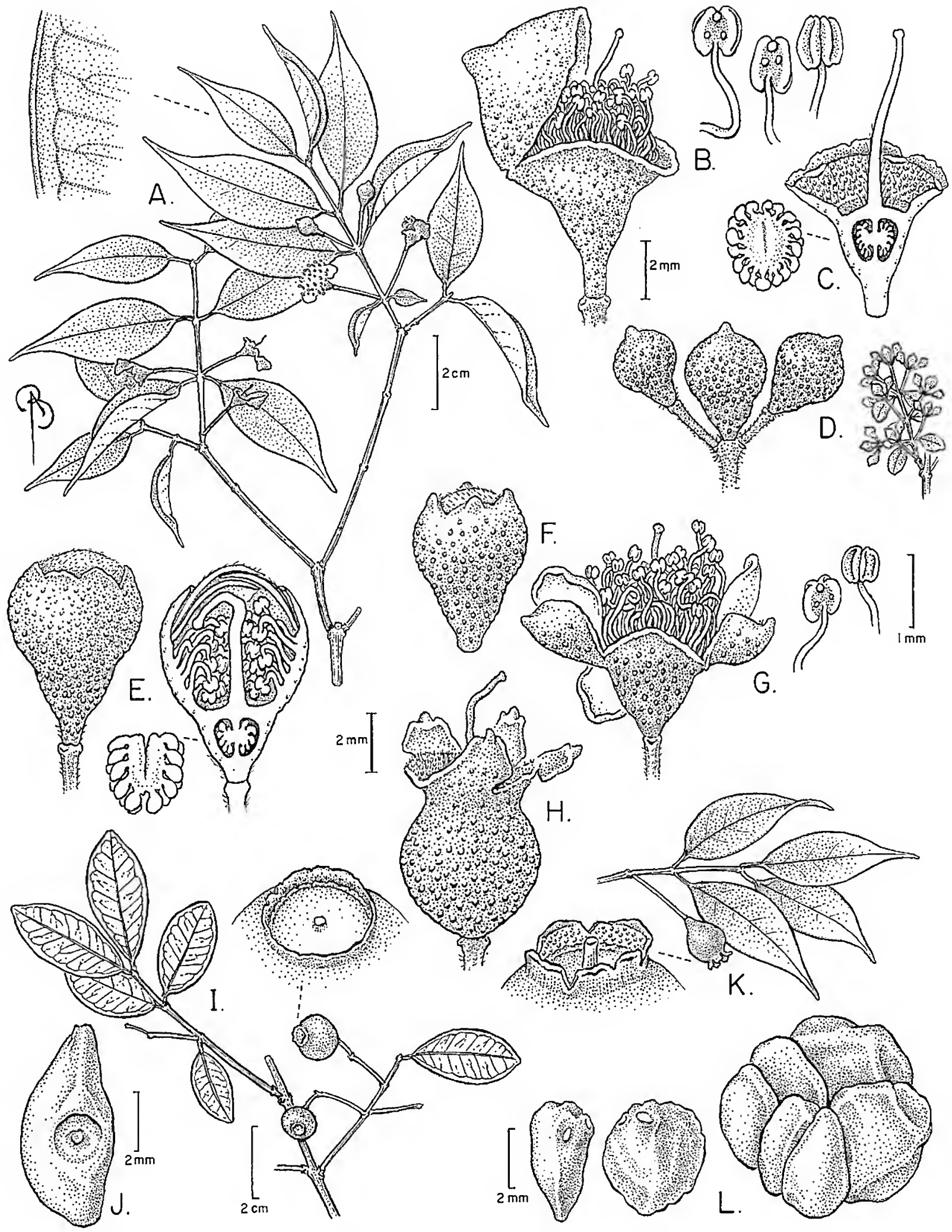


Fig. 21. *Psidium nutans*. **A**. Herbarium sheet of *P. nutans* from Reserva Natural del Bosque Mbaracayú, Canindeyú, Paraguay. **B**. Leaf venation. **C**. Map of distribution in Bahia. **D**. Flower buds. (A, D from *Landrum 8841*, ASU; B from *Killeen 6974*, ASU).



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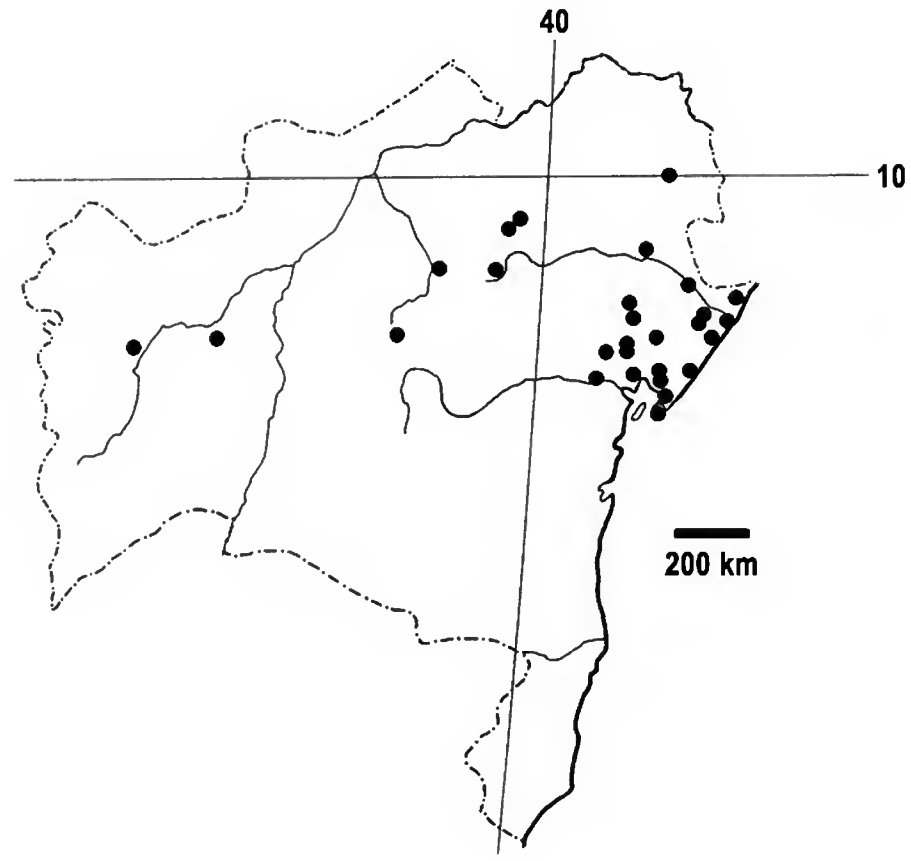
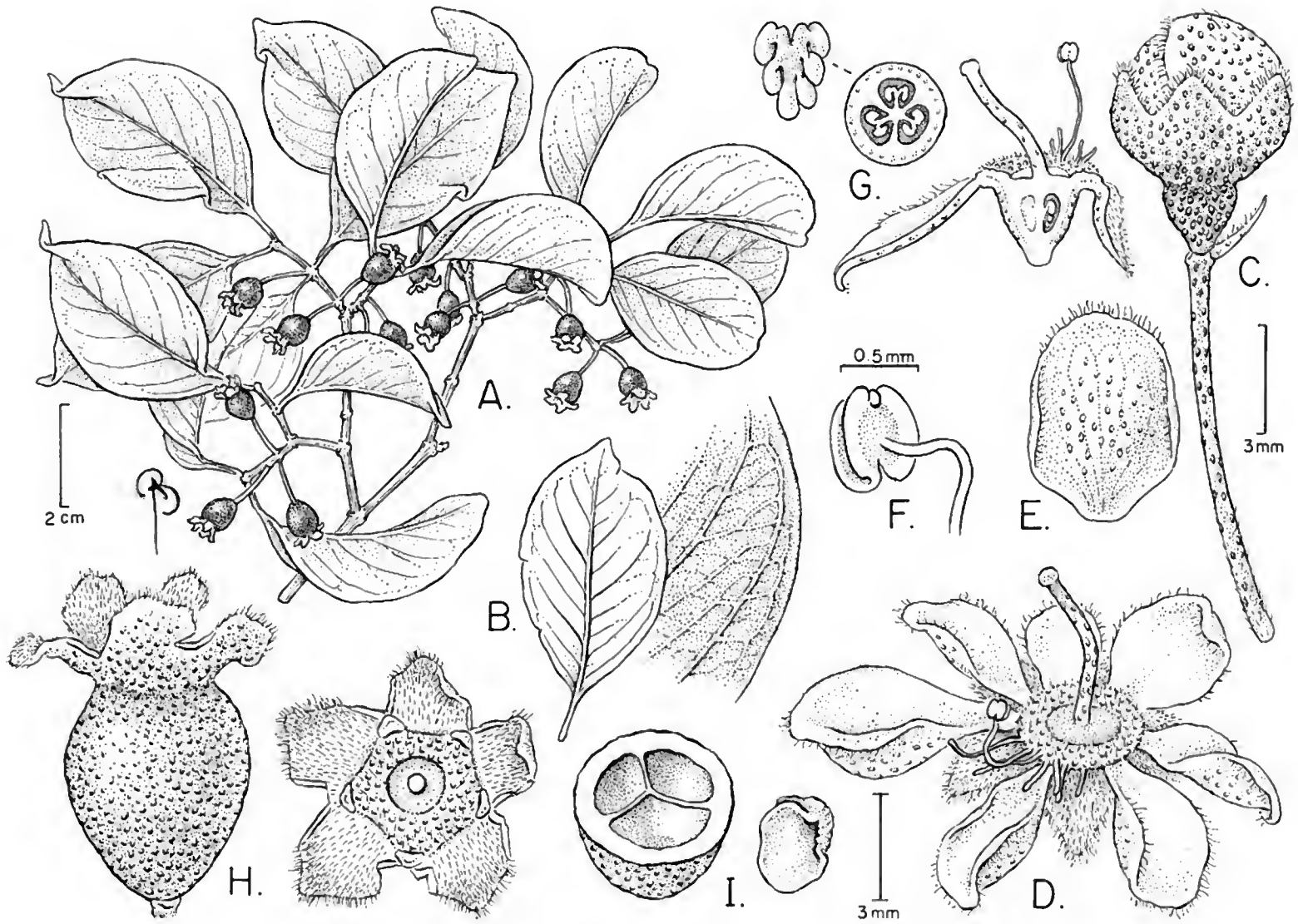


Fig. 22. *Psidium oligospermum*: illustration (on previous page) and map. **A**. Flowering branch. **B**. Opening flower with calyptra; anthers with terminal gland and two smaller glands below. **C**. Longitudinal section of flower with peltate placenta extracted. **D**. Three-flowered dichasium and cluster of dichasia. **E**. Flower bud, placenta with ovules extracted and longitudinal section of bud. **F**. Flower bud from side; calyx with apical protuberances, these evident in G and H also. **G**. Opening flower from side; two views of an anther, one showing terminal gland and two smaller glands below. **H**. Young fruit from side. **I**. Twig with fruits; apical view of fruit with calyx and staminal ring having fallen. **J**. Seed with view of operculum. **K**. Twig with leaves and fruit; view of fruit apex with calyx having fallen and staminal ring persisting. **L**. Cluster of seeds from a fruit and two individual seeds showing flat and rounded sides. (A–C from *Pirani and Kallunki 2664*, ASU; D from *Nuñez 8602*, ASU; E from *Smith 9729*, ASU; F–G from *Landrum 6524*, ASU; H from *Landrum 6518*; I–J from *Guillen and Lazo 4340*, ASU; K–L from *Landim* 561, ASU).



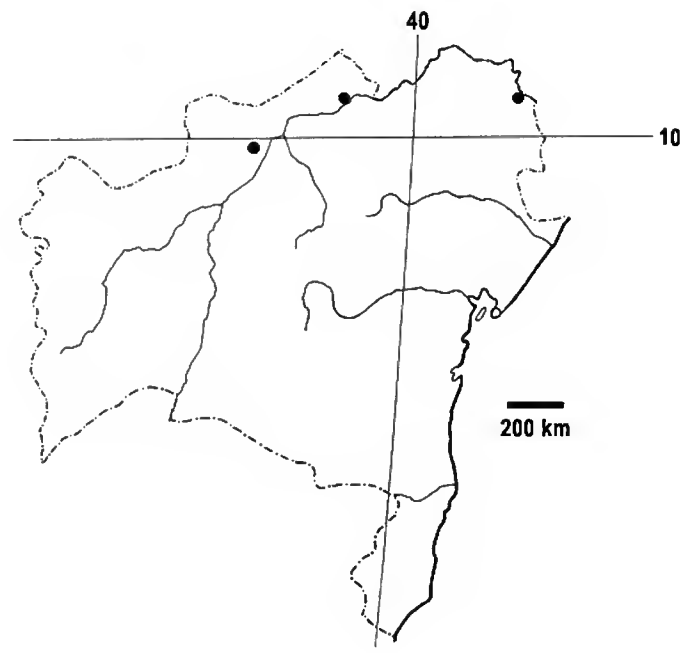
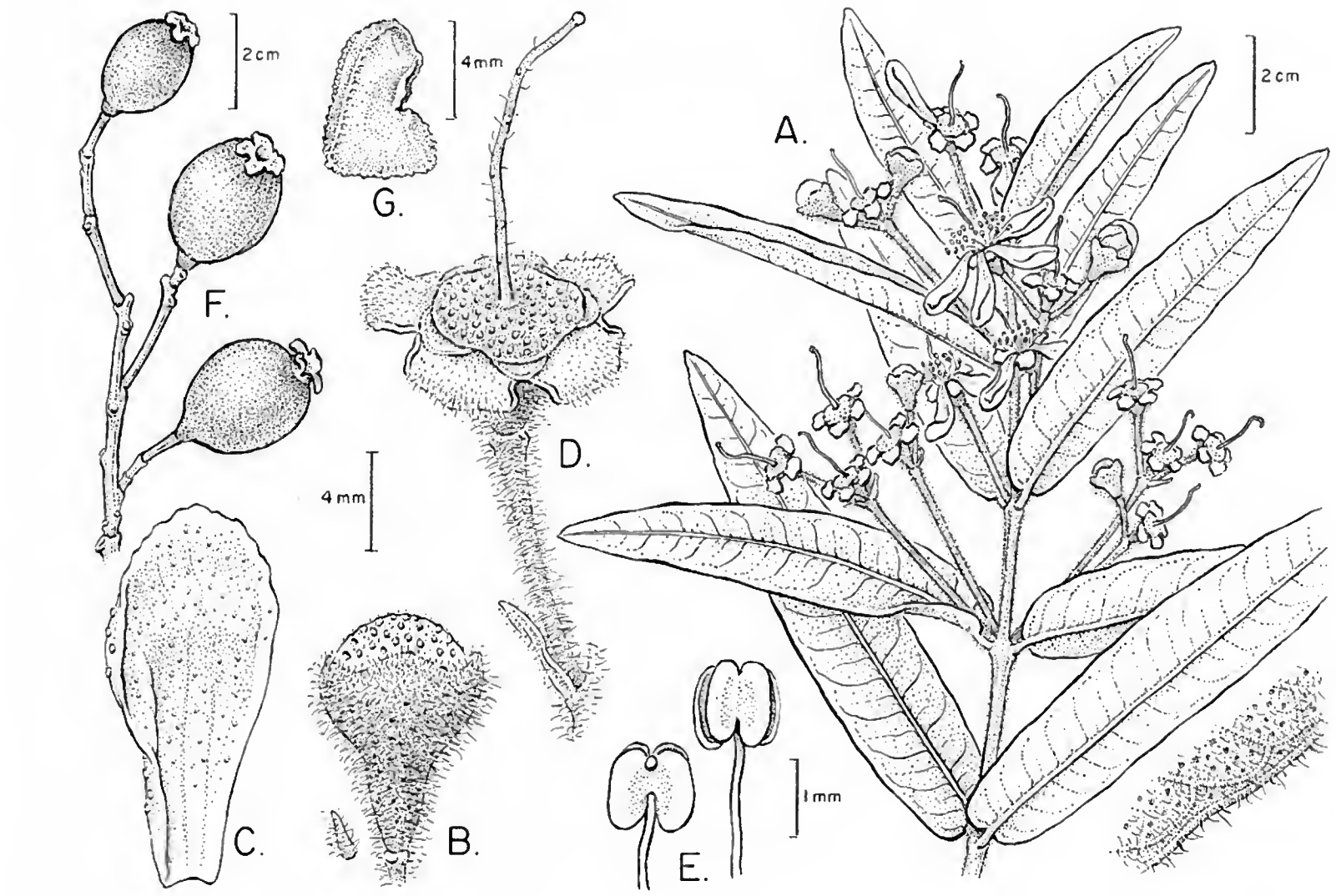


Fig. 23. *Psidium rhombeum*: illustration and map. **A**. Fruiting branch. **B**. Typical leaf with close-up of tertiary venation pattern. **C**. Flower bud with one bracteole having fallen. **D**. Open flower near end of anthesis with 6 petals. **E**. Petal. **F**. Anther with a terminal gland. **G**. Longitudinal section of old flower; cross section of ovary, with placenta and ovules extracted. **H**. Young fruit from side and above. **I**. Cross section of fruit with one immature seed. (A, B, H, I from *Moraes 626*, ASU; C–G from *Queiroz 8075*, ASU).



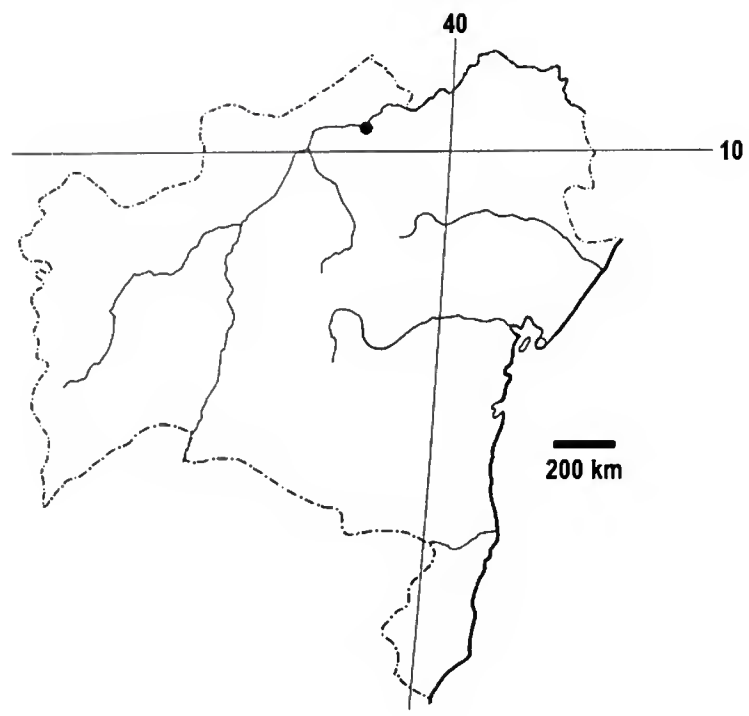
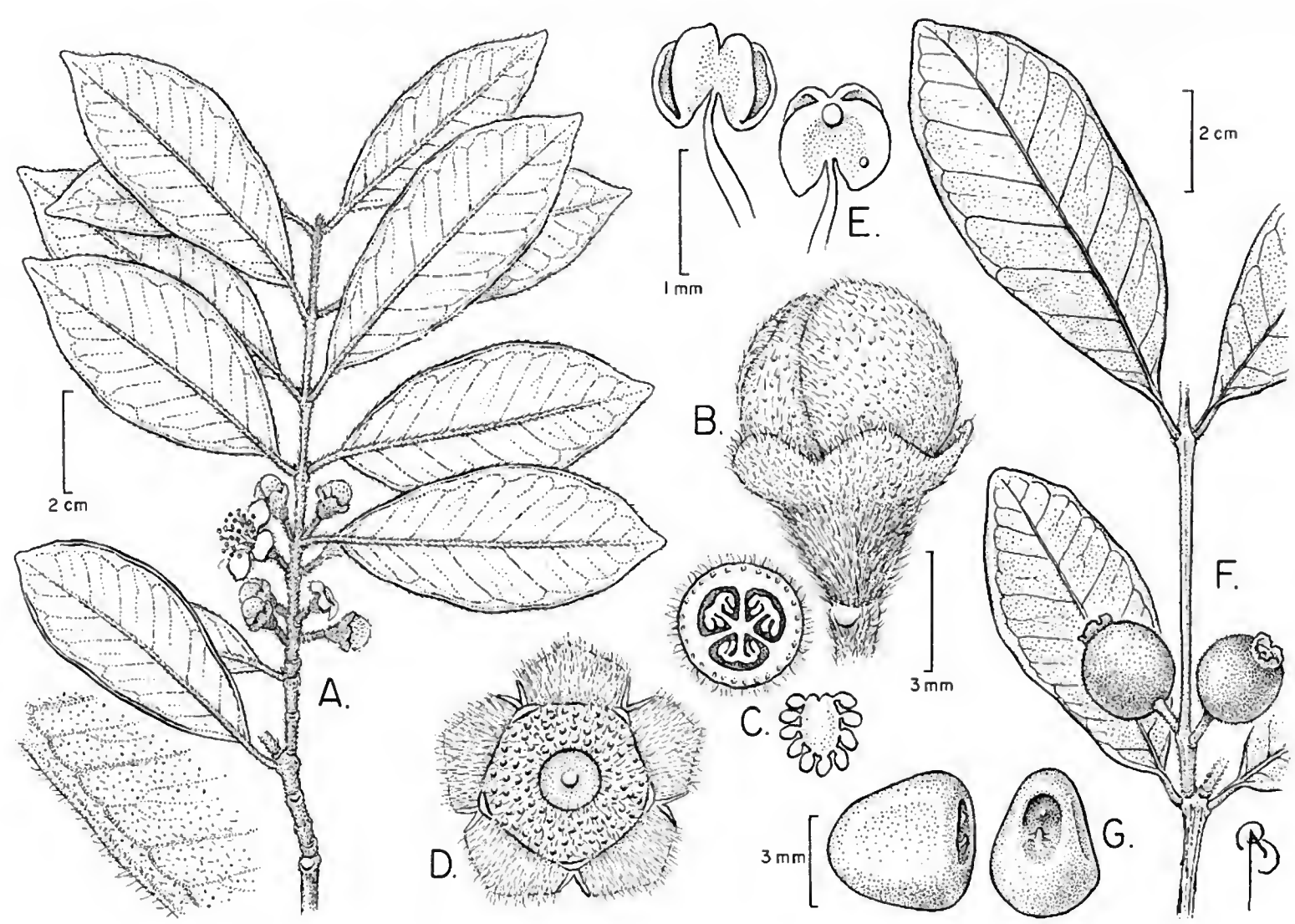


Fig. 24. *Psidium riparium*: illustration and map **A.** Flowering branch with dichasial inflorescences common; close-up of venation on lower right. **B**. Flower bud with detached bracteole. **C**. Petal. **D**. Flower after anthesis showing tears between calyx lobes not penetrating the staminal ring. **E**. Two views of anther with terminal gland. **F**. Fruits on remnants of inflorescence. **G**. Seed, showing angular shape. (A–E from *Santos et al. 133*, ASU; F, G from *da Silva et al. 4200*, ASU).

Fig. 25. *Psidium rotundidiscum*. **A**. Herbarium sheet. **B**. Close up of young fruits. **C**. Section of nearly mature fruit and seeds; seeds have rounded side facing fruit wall and generally flat sides where seeds abut each other. **D**. Map of distribution. (A, B from specimens of *Mori et al. 10049*, NY; C from specimens of *Mori et al. 10049,* CAS).



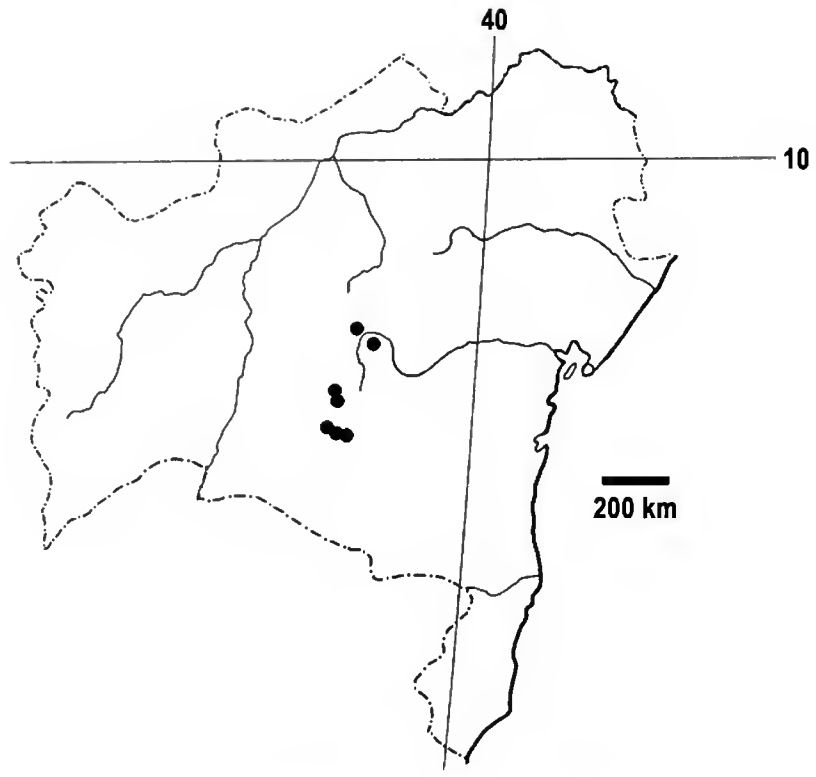
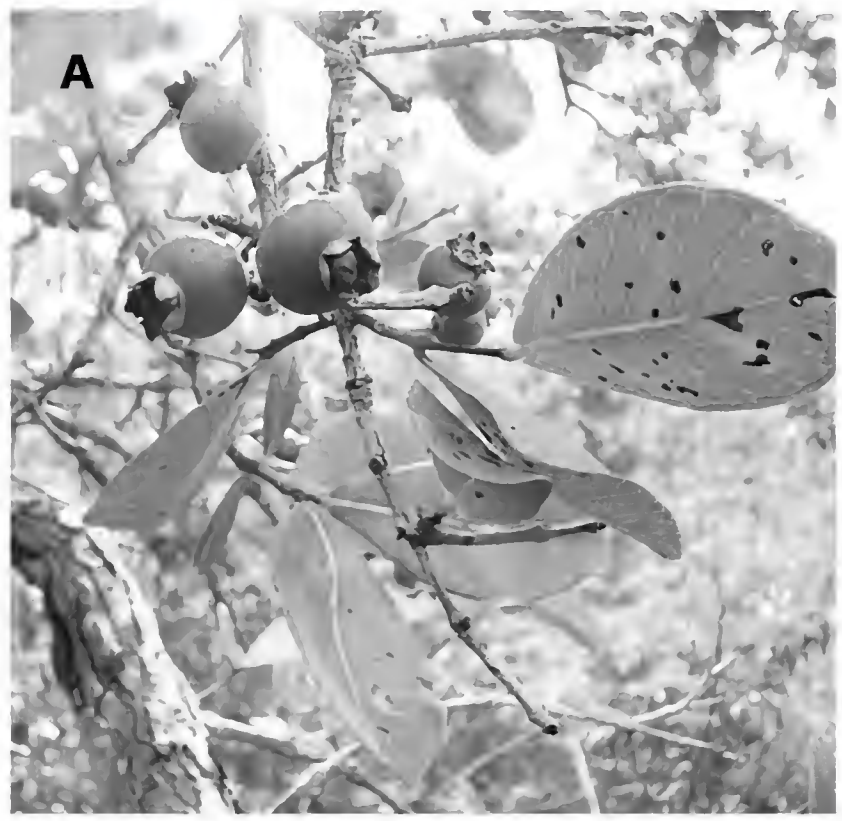
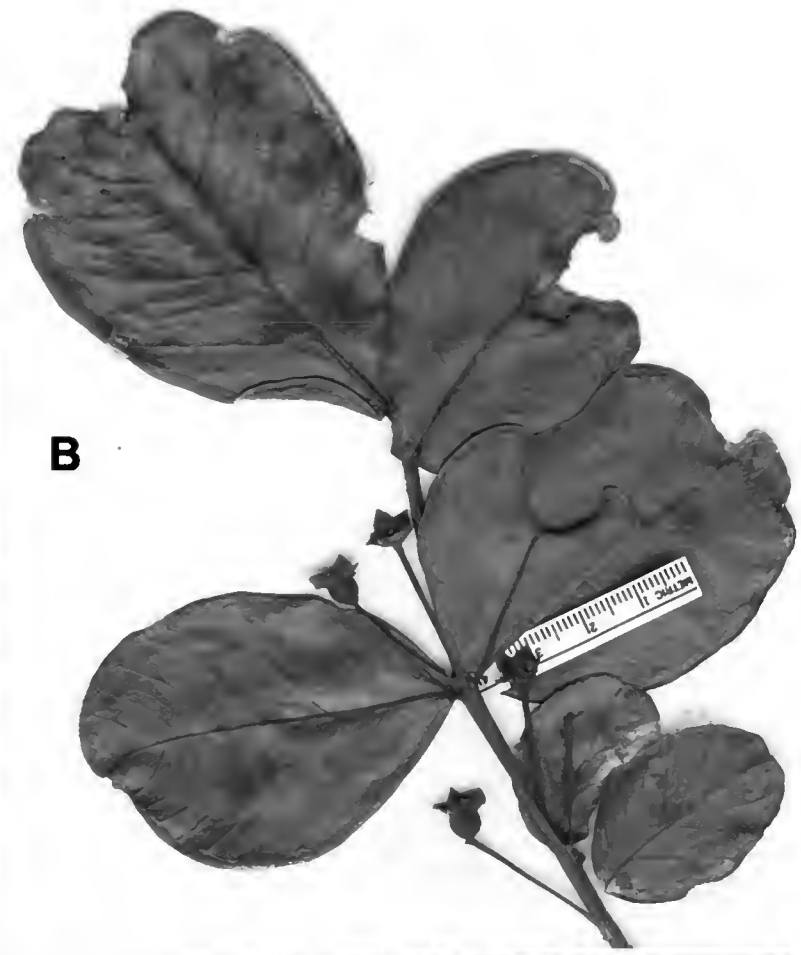
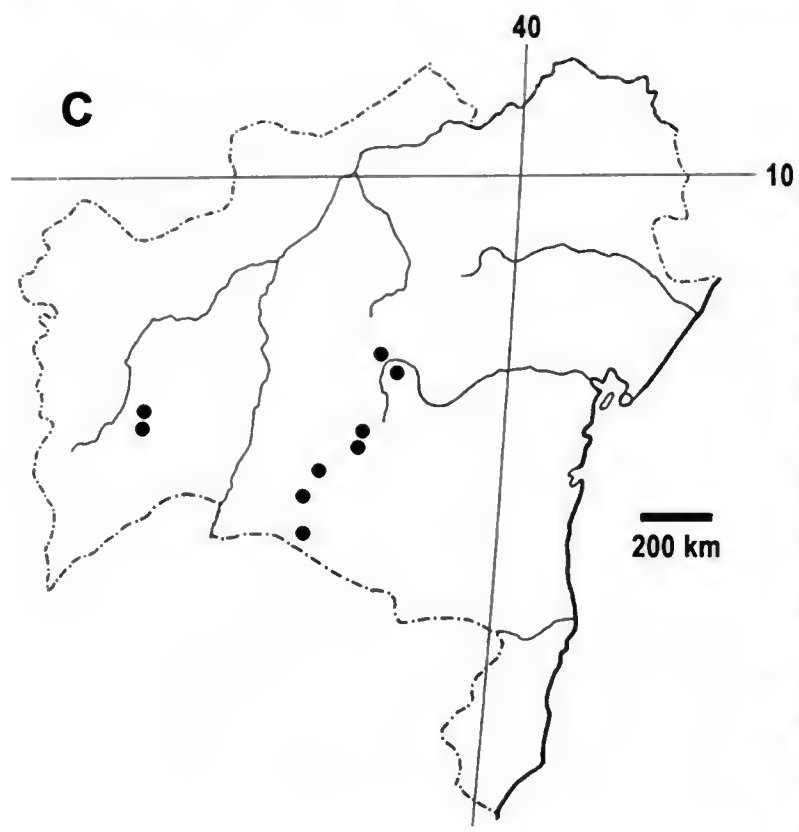


Fig. 26. *Psidium rufum*: illustration and map. **A**. Twig with leaves, flower buds, and open flower. **B**. Closed flower bud. **C**. Cross section of ovary showing three locules and peltate placenta; extracted peltate placenta with ovules. **D**. Summit of ovary and calyx lobes from above after anthesis. **E**. Anther with a terminal gland and second smaller gland below; in second view the glands are not visible. **F**. Twig with leaves and two fruits. **G**. Two views of a seed. (A–E from *Harley et al. 25891*, ASU; F from *da Silva 1908*, ASU; G from *Harley 24582*, ASU).







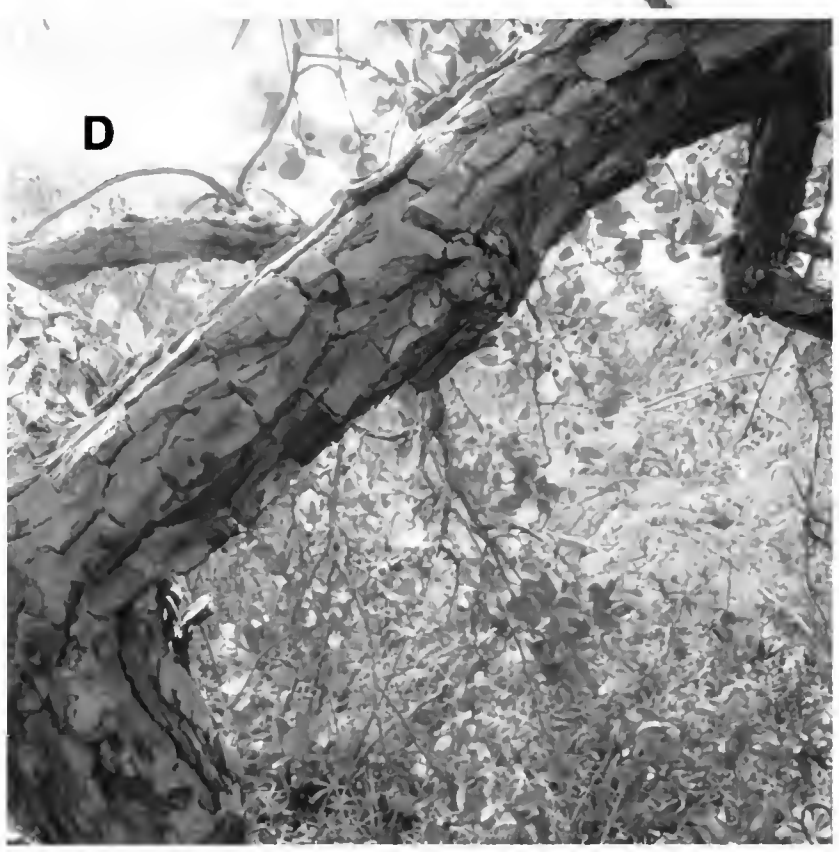
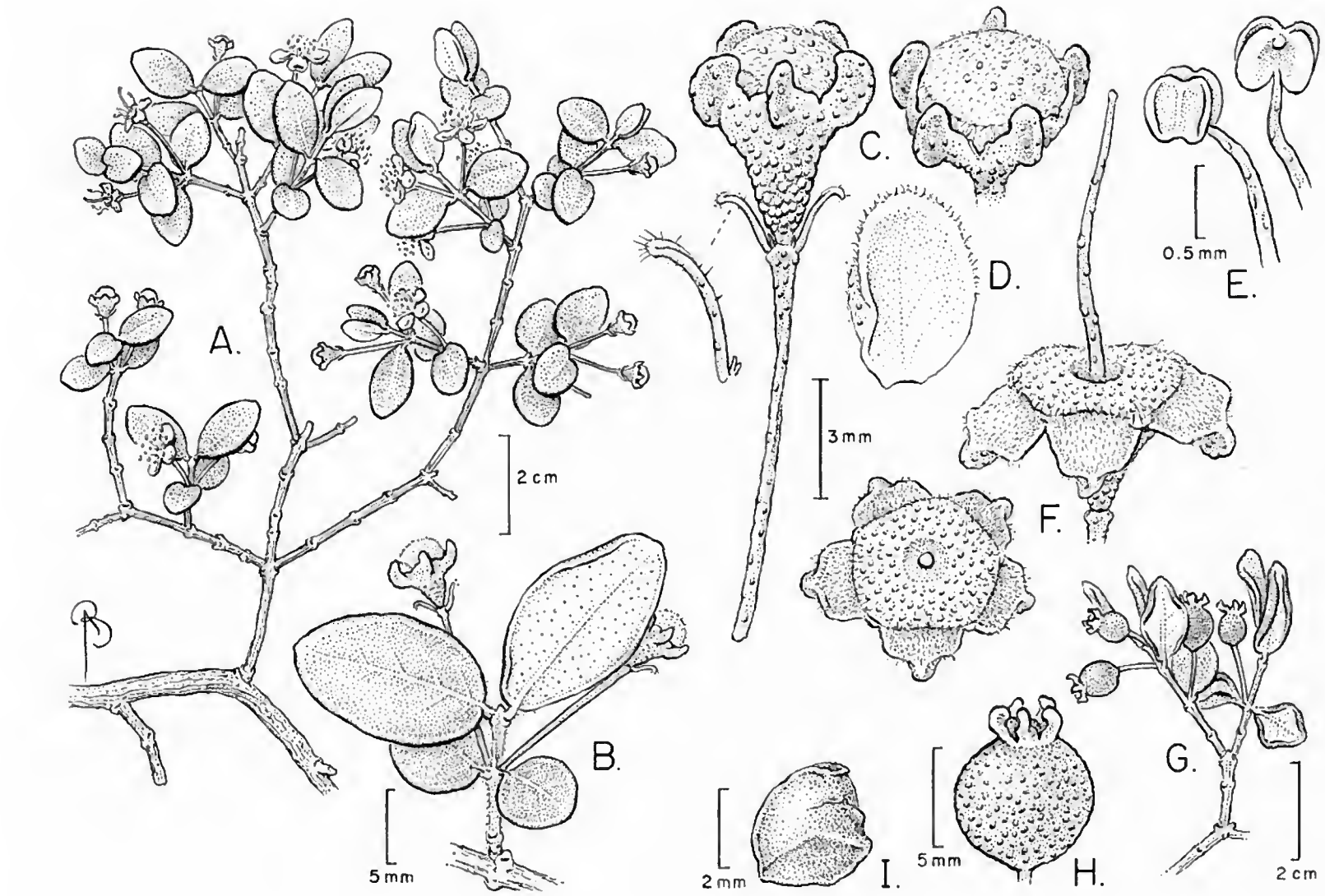


Fig. 27. *Psidium salutare* var. *pohlianum*. **A**. Young branch with fruits. **B**. twig with very young fruits. **C**. Map of distribution. **D**. Stem showing rough bark. (A, D photos by M. Alves of *Roque et al. 3363*, photo specimen at ASU; B from *Irwin et al. 9101*, NY).



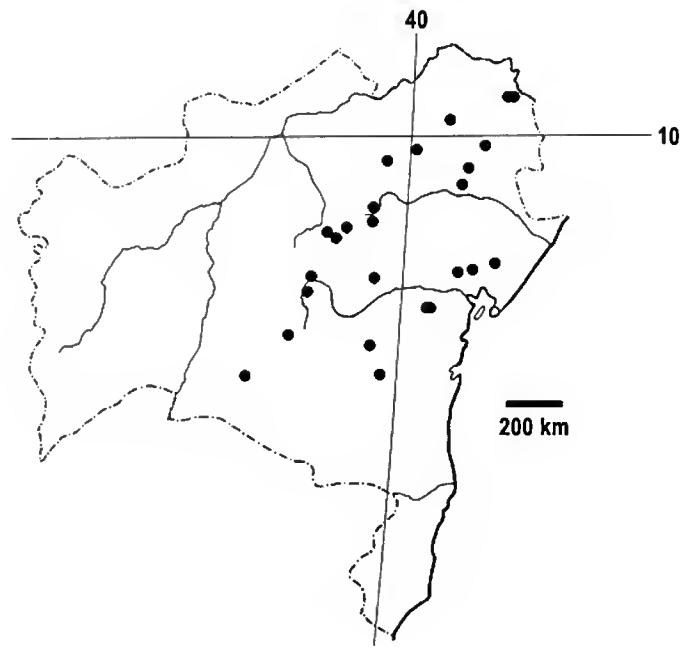


Fig. 28. *Psidium schenckianum*: illustration and map. **A**. Flowering branch. **B**. Twig with flower buds and leaves with obscure venation and revolute margins. **C**. Flower buds, the beginning of tears between the calyx lobes evident on right bud. **D**. Petal with ciliate margin. **E**. Two views of an anther with a terminal gland. **F**. Flowers after anthesis showing tears between calyx lobes not penetrating the staminal ring. **G**. Twig with fruits. **H**. Fruit showing persistent calyx. **I**. Seed showing flat and rounded sides. (A–F., from *Cardoso 900*, ASU; G–I from *Miranda 760*, ASU).

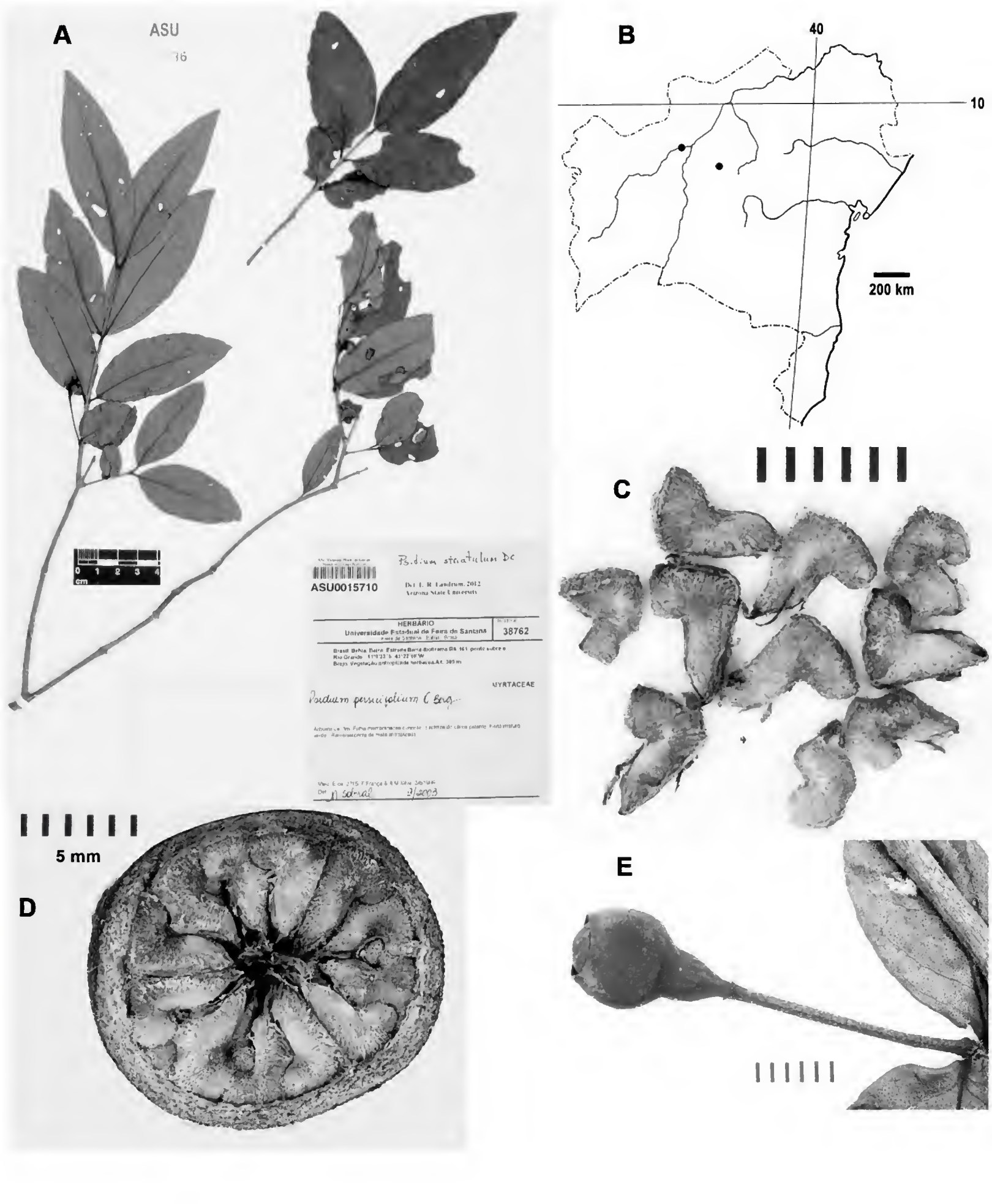
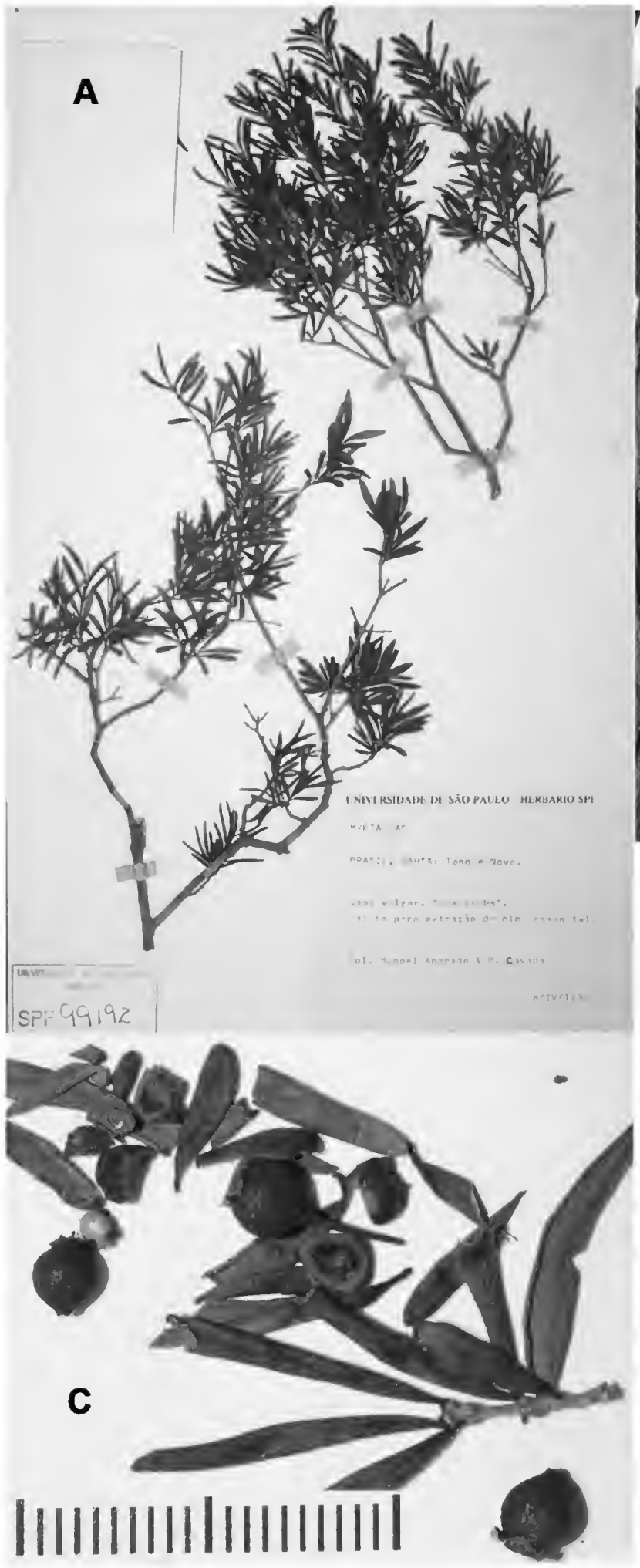


Fig. 29. *Psidium striatulum*. **A**. Sheet of *P. striatulum* from Bahia, Mun. Barra. **B**. Map of distribution. **C**. Seeds with typical angular shape. **D**. Cross Section of fruit showing arrangement of seeds. **E**. Flower bud with a terminal pore. Scales in C–E, 5 mm. (A, *Melo et al. 2715*, ASU; C, D from *Davis 807*, NY; E from *Ferreira 9638*, ASU).



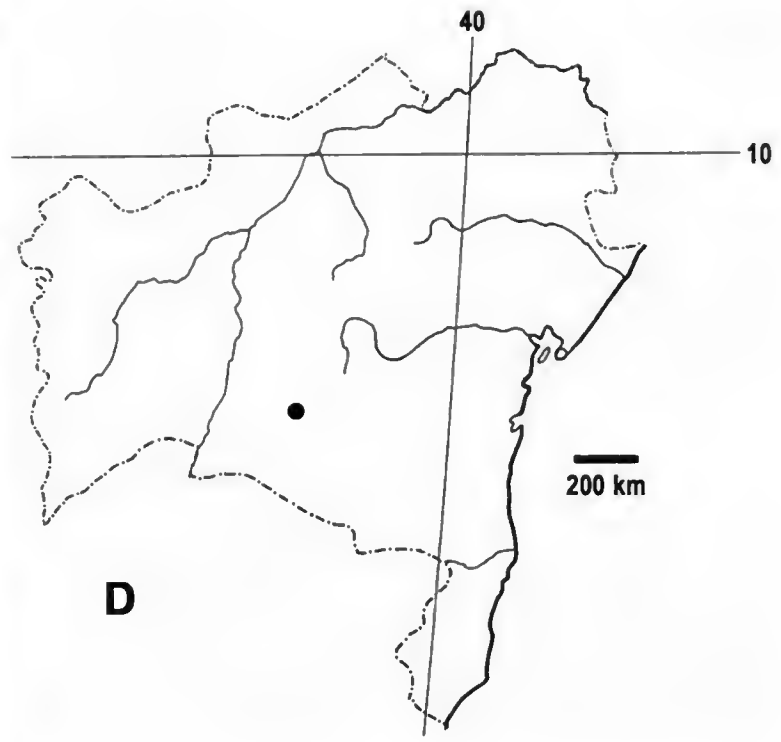


Fig. 30. *Psidium sp. A*. **A**. Herbarium sheet. **B**. Close-up of leaves and twigs showing swollen nodes and revolute leaf margins. **C**. Close-up of leaves, immature fruits, and one seed just above and to right of fruit on right side of image. **D**. Map of distribution. (A–C from *Andrade and Cavada s.n.*, SPF).

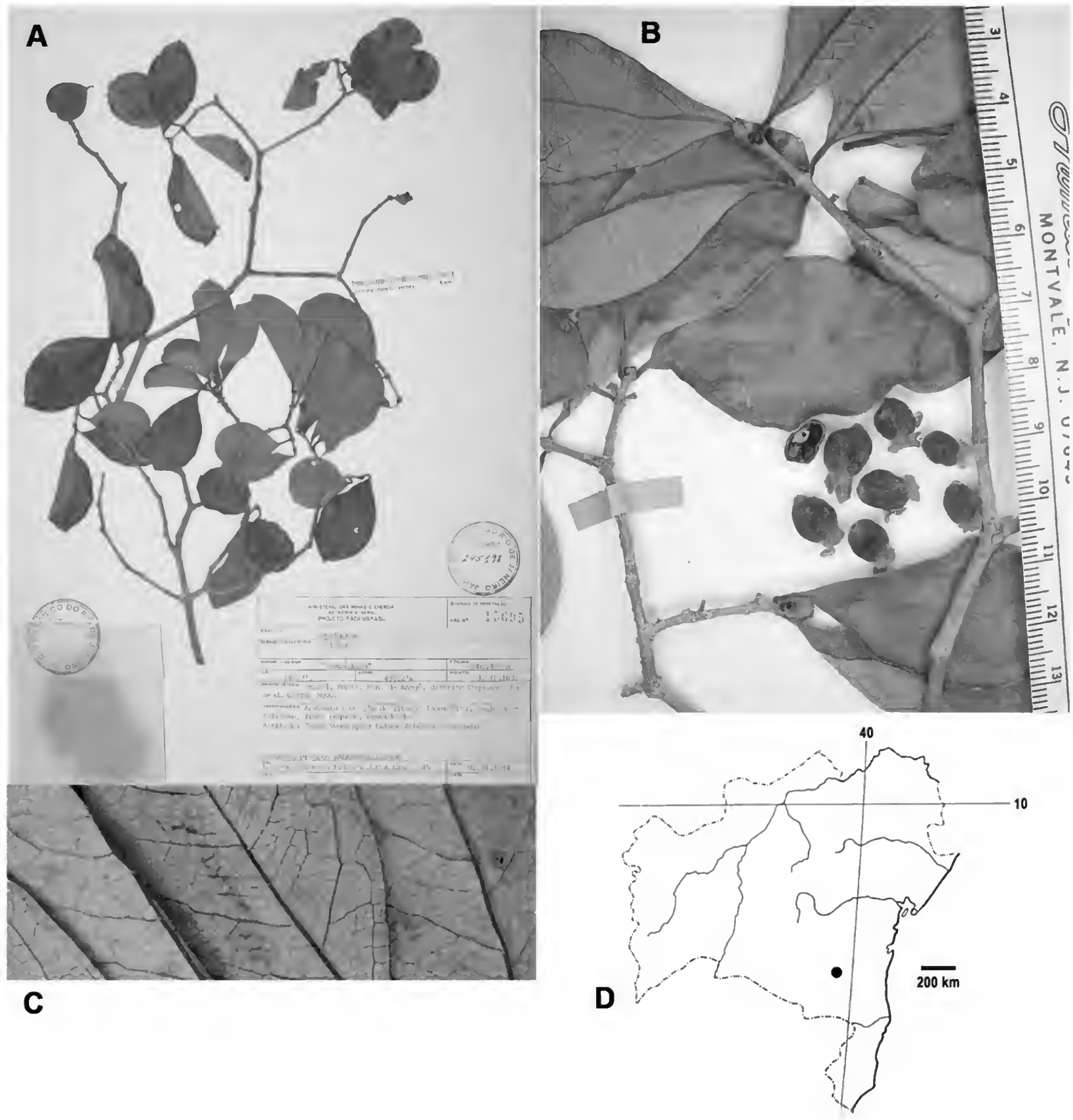
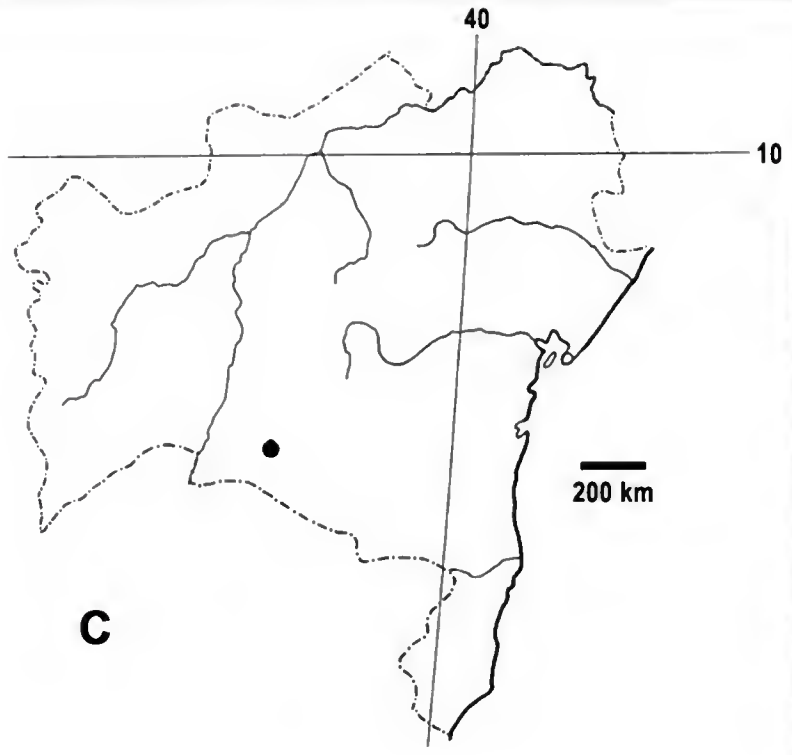


Fig. 31. *Psidium sp. B.* **A**. Herbarium sheet. **B**. Close-up of leaves, twigs, and young fruits. **C**. Close-up of lower surface of leaves showing venation pattern. **D**. Map of distribution. (A, C from *Oliveira and Lima 145*, RB; B from *Oliveira and Lima 145*, HRB).



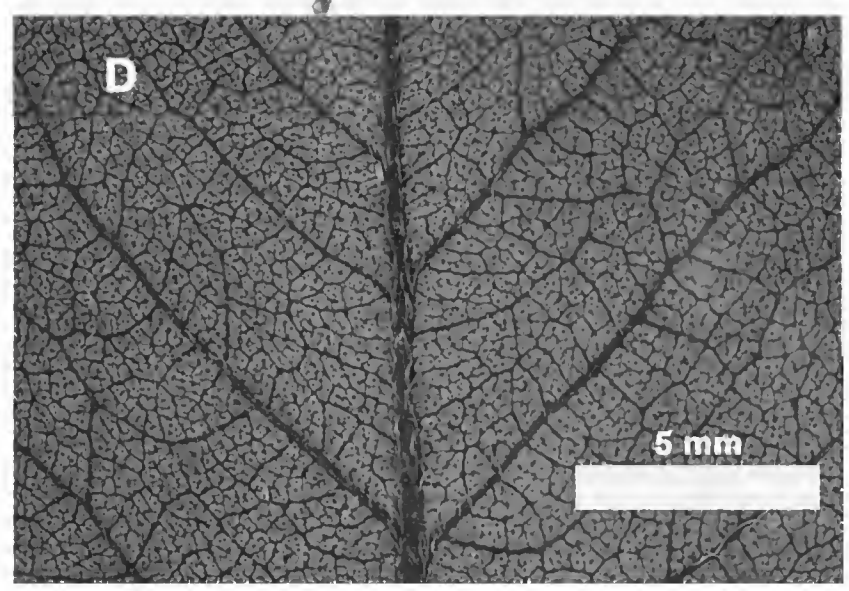


Fig. 32. *Psidium sp. C*. **A**. Herbarium sheet. **B**. Close-up of twigs and flowers after anthesis, the upper flower with a rostrate calyptra still attached. **C**. Map of distribution. D. Close-up of lower surface of leaf showing venation pattern and scattered appressed hairs. (A, C, D from *Guedes et al. 2922*, ALCB).

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INDEX TO FAMILIES OF THE VASCULAR PLANTS OF ARIZONA

Published treatments (**in bold**) can be found in volumes 26, 27, 29, 30, 32, 33, and 35 of the *Journal of the Arizona-Nevada Academy of Science* (**JANAS**) or in subsequent volumes (1–12) of **CANOTIA**. Unbolded entries indicate families with no treatments published to date. Figure numbers refer to illustrations in the "Key to Families of Vascular Plants in Arizona" in **JANAS** 35(2). All Vascular Plants of Arizona treatments are available as pdf files online (http://www.canotia.org/vpa_project.html).

Acanthaceae CANOTIA 12:22-54. 2016. (T. Daniel)
Aceraceae JANAS 29(1):2. 1995. (L.R. Landrum)
Adiantaceae (Fig. 1)
Agavaceae Part 1: *Agave* JANAS 32(1):1. 1999. (W. Hodgson)
Aizoaceae Alismataceae Amaranthaceae (Fig. 4)
Anacardiaceae CANOTIA 3(2):13. 2007. (J.L. Anderson)
Apiaceae (Fig. 5)
Apocynaceae JANAS 27(2):164. 1994. (S.P. McLaughlin)
Araceae
Araliaceae
Arecaceae JANAS 32(1):22. 1999. (C.T. Mason, Jr.)
Aristolochiaceae JANAS 32(1):24. 1999. (C.T. Mason, Jr.)
Asclepiadaceae JANAS 27(2):169. 1994. (E. Sundell)
Aspleniaceae
Asteraceae (Figs. 6–7)
Azollaceae CANOTIA 4(2):31. 2008. (G. Yatskievych and M.D. Windham)
Berberidaceae JANAS 26(1):2. 1992. (J.E. LaFerriere; Fig. 9)
Betulaceae JANAS 33(1):1. 2001. (J.W. Brasher)
Bignoniaceae JANAS 32(1):26. 1999. (C.T. Mason, Jr.)
Bixaceae JANAS 27(2):188. 1994. (W. Hodgson)
Blechnaceae CANOTIA 4(2):35. 2008. (G. Yatskievych and M.D. Windham; Fig. 1)
Boraginaceae (Fig. 9)
Brassicaceae
Bromeliaceae CANOTIA 3(2):23. 2007. (R. Gutierrez, Jr.)
Buddlejaceae JANAS 26(1):5. 1992. (E.M. Norman)
Burseraceae JANAS 32(1):29. 1999. (A. Salywon)
Cactaceae Part One: The Cereoid Cacti JANAS 29(1):6. 1995. (D.J. Pinkava)
Cactaceae Part Two: *Echinocactus* JANAS 29(1):13. 1995. (M. Chamberland)
Cactaceae Part Three: *Cylindropuntia* JANAS 32(1):32. 1999. (D.J. Pinkava)
Cactaceae Part Four: *Grusonia* JANAS 32(1):48. 1999. (D.J. Pinkava)
Cactaceae Part Five: *Pediocactus* and *Sclerocactus* JANAS 33(1):9. 2001. (K.D. Heil and J.M. Porter)
Cactaceae Part Six: *Opuntia* JANAS 35(2):137. 2003. (D.J. Pinkava).
Callitrichaceae JANAS 29(1):15. 1995. (J. Ricketson)
Campanulaceae
Cannabaceae JANAS 32(1):53. 1999. (C.T. Mason, Jr.)
Capparaceae (Fig. 8)
Caprifoliaceae (Fig. 10)
Caryophyllaceae (Fig. 10)
Celastraceae JANAS 30(2):57. 1998. (J.W. Brasher)
Ceratophyllaceae JANAS 29(1):17. 1995. (J. Ricketson)
Chenopodiaceae (Fig. 9)
Clusiaceae
Commelinaceae JANAS 33(1):19. 2001. (R. Puente and R. Faden)
Convolvulaceae JANAS 30(2):61. 1998. (D.F. Austin)
Cornaceae
Crassulaceae JANAS 27(2):190. 1994. (R. Moran)
Crossosomataceae JANAS 26(1):7. 1992. (C. Mason)
Cucurbitaceae CANOTIA 12:55-85. 2016. (M. Butterwick)
Cupressaceae JANAS 27(2):195. 1994. (J. Bartel)
Cuscutaceae
Cyperaceae Part One: Key to the Genera and *Carex*. CANOTIA 11(1):1. 2015. (G. Rink and M. Licher)
Dennstaedtiaceae CANOTIA 4(2):38. 2008. (G. Yatskievych and M.D. Windham; Fig. 1)
Dipsaceae JANAS 27(2):201. 1994. (J.E. LaFerriere)
Dryopteridaceae (Fig. 1)
Elaeagnaceae
Elatinaceae
Ephedraceae (Fig. 2)
Ericaceae CANOTIA 4(2):21. 2008. (J.L. Anderson; Fig. 11)
Euphorbiaceae Part One: *Acalypha* and *Cnidoscolus* JANAS 29(1):18. 1995. (G.A. Levin)
Equisetaceae CANOTIA 4(2):41. 2008. (G. Yatskievych and M.D. Windham)
Fabaceae Part One: *Errazuria*, *Marina*, *Parryella*, and *Psorothamnus* CANOTIA 7:1. 2011 (S. Rhodes, J. Beasley, and T. Ayers; Figs. 12–13)
Fagaceae JANAS 27(2):203. 1994. (L.R. Landrum)
Fouquieriaceae JANAS 32(1):55. 1999. (C.T. Mason, Jr.)
Fumariaceae JANAS 33(1):27. 2001. (S. Holiday and A. Perez)
Garryaceae JANAS 33(1):31. 2001. (R. Puente and T.F. Daniel)
Gentianaceae JANAS 30(2):84. 1998. (C.T. Mason, Jr.)
Geraniaceae (Fig. 14)
Grossulariaceae
Haloragaceae
Hippuridaceae JANAS 29(1):25. 1995. (J. Ricketson)
Hydrangeaceae
Hydrocharitaceae
Hydrophyllaceae (Fig. 14)
Iridaceae Part One: *Sisyrinchium* JANAS 27(2):215. 1994. (A.F. Cholewa and D.M. Henderson)
Iridaceae Part Two: *Iris* and *Nemastylis* JANAS 33(1):35. 2001. (C.T. Mason, Jr.)
Isoëtaceae CANOTIA 5(1):27. 2009. (G. Yatskievych and M.D. Windham)
Juglandaceae JANAS 27(2):219. 1994. (J.E. LaFerriere)
Juncaceae (Fig. 19)
Juncaginaceae
Key to Families of Vascular Plants in Arizona JANAS 35(2):88. 2003. (D.J. Keil)
Krameriaceae JANAS 32(1):57. 1999. (B.B. Simpson and A. Salywon)

Lamiaceae Part One: *Agastache, Hyptis, Lamium, Leonurus, Marrubium, Monarda, Monardella, Nepeta, Salazaria, Stachys, Teucrium, and Trichostema* JANAS 35(2):151. 2003. (C.M. Christy, D.Z. Damrel, A. Henry, A. Trauth- Nare, R. Puente-Martinez, and G. Walters)
Lemnaceae JANAS 26(1):10. 1992. (E. Landolt)
Lennoaceae JANAS 27(2):220. 1994. (G. Yatskievych)
Lentibulariaceae CANOTIA 8(2):54-58. 2012. (B. Rice)
Liliaceae (Fig. 19)
Linaceae
Loasaceae JANAS 30(2):96. 1998. (C.M. Christy)
Lythraceae
Malpighiaceae
Malvaceae Part One: All genera except *Sphaeralcea*. JANAS 27(2):222. 1994. (P.A. Fryxell)
Marsileaceae CANOTIA 5(1):30. 2009. (G. Yatskievych and M.D. Windham)
Martyniaceae CANOTIA 3(2):26. 2007. (R. Gutierrez, Jr.)
Meliaceae
Menispermaceae JANAS 27(2):237. 1994. (J.E. LaFerriere)
Menyanthaceae JANAS 33(1):38. 2001. (C.T. Mason, Jr.)
Monotropaceae JANAS 26(1):15. 1992. (E. Haber)
Molluginaceae JANAS 30(2):112. 1998. (C.M. Christy)
Moraceae
Najadaceae
Nyctaginaceae (Fig. 14)
Nymphaeaceae JANAS 29(1):26. 1995. (J. Ricketson)
Oleaceae (Fig. 15)
Onagraceae (Fig. 15)
Ophioglossaceae
Orchidaceae
Orobanchaceae
Oxalidaceae JANAS 30(2):115. 1998. (R. Ornduff and M. Denton)
Papaveraceae JANAS 30(2):120. 1998. (G.B. Ownbey with contributions by J.W. Brasher and C. Clark)
Passifloraceae JANAS 33(1):41. 2001. (J.M. MacDougal)
Phrymaceae CANOTIA 12:1-21. 2016. (K. Hansen, E. Johnson, K.O. Phillips, J. Talboom and T. Ayers)
Phytolaccaceae JANAS 33(1):46. 2001. (V. Steinmann)
Pinaceae
Plantaginaceae JANAS 32(1):62. 1999. (K.D. Huisinga and T.J. Ayers)
Platanaceae JANAS 27(2):238. 1994. (J.E. LaFerriere)
Plumbaginaceae
Poaceae (Fig. 20)
Polemoniaceae CANOTIA 1:1. 2005. (D. Wilken and M. Porter)
Polygalaceae
Polygonaceae (Fig. 15)
Polypodiaceae CANOTIA 5(1):34. 2009. (G. Yatskievych and M.D. Windham; Fig. 1)
Pontederiaceae JANAS 30(2):133. 1998. (C.N. Horn)
Portulacaceae CANOTIA 2(1):1. 2006. (A. Bair, M. Howe, D. Roth, R. Taylor, T. Ayers, and R.W. Kiger)
Potamogetonaceae
Primulaceae JANAS 26(1):17. 1992. (A.F. Cholewa; Fig. 16)
Psilotaceae CANOTIA 3(2):32. 2007. (R. Gutierrez, Jr.)
Pyrolaceae JANAS 26(1):22. 1992. (E. Haber)
Rafflesiaceae JANAS 27(2):239. 1994. (G. Yatskievych)
Ranunculaceae (Fig.15)
Resedaceae
Rhamnaceae CANOTIA 2(1):23. 2006. (K. Christie, M. Currie, L. Smith Davis, M-E. Hill, S. Neal, and T. Ayers)
Rosaceae Part One: *Rubus*. JANAS 33(1):50. 2001. (J.W. Brasher)
Rubiaceae JANAS 29(1):29. 1995. (L. Dempster and E.T. Terrell; Fig. 16)
Ruppiaceae
Rutaceae
Salicaceae Part One: *Populus*. JANAS 26(1):29. 1992. (J.E. Eckenwalder)
Salicaceae Part Two. *Salix*. JANAS 29(1):39. 1995. (G.W. Argus)
Salviniaceae CANOTIA 4(2):50. 2008. (G. Yatskievych and M.D. Windham)
Santalaceae JANAS 27(2):240. 1994. (J.E. LaFerriere)
Sapindaceae JANAS 32(1):76. 1999. (A. Salywon)
Sapotaceae JANAS 26(1):34. 1992. (L.R. Landrum)
Saururaceae JANAS 32(1):83. 1999. (C.T. Mason, Jr.)
Saxifragaceae JANAS 26(1):36. 1992. (P. Elvander; Fig. 16)
Scrophulariaceae (Fig. 17) **(see also Phrymaceae)**
Selaginellaceae CANOTIA 5(1):39. 2009. (G. Yatskievych and M.D. Windham)
Simaroubaceae JANAS 32(1):85. 1999. (J.W. Brasher)
Simmondsiaceae JANAS 29(1):63. 1995. (J. Rebman)
Solanaceae Part One: *Datura*. JANAS 33(1):58. 2001. (R. Bye)
Solanaceae Part Two: Key to the Genera and *Solanum*. CANOTIA 5(1):1. 2009. (S.T. Bates, F. Farruggia, E. Gilbert R. Gutierrez, D. Jenke, E. Makings, E. Manton, D. Newton, and L.R. Landrum)
Solanaceae Part Three: *Lycium*. CANOTIA 5(1):17. 2009. (F. Chiang and L.R. Landrum)
Solanaceae Part Four: *Physalis* and *Quincula*. CANOTIA 9:1-12. 2013. (L.R. Landrum, A. Barber, K. Barron, F.S. Coburn, K. Sanderford, and D. Sctaro)
Solanaceae Part Five: *Chamaesaracha*. CANOTIA 9:13-15. 2013. (E. Manton)
Sparganiaceae JANAS 33(1):65. 2001. (J. Ricketson)
Sterculiaceae
Tamaricaceae
Thelypteridaceae CANOTIA 5(1):49. 2009. (G. Yatskievych and M.D. Windham)
Tiliaceae
Typhaceae JANAS 33(1):69. 2001. (J. Ricketson)
Ulmaceae JANAS 35(2):170. 2003. (J.W. Brasher)
Urticaceae JANAS 26(1):42. 1992. (D. Boufford)
Valerianaceae
Verbenaceae
Violaceae. JANAS 33(1):73. 2001. (R.J. Little; Fig. 17)
Viscaceae JANAS 27(2):241. 1994. (F.G. Hawksworth and D. Wiens)
Vitaceae
Zannichelliaceae
Zygophyllaceae (Fig. 17)